

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.



134TH SESSION.

FROM NOVEMBER 1921 TO JUNE 1922.

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SUPPLEMENT: Notes on the Catalogue of the
Linnean Herbarium.

PUBLICATIONS: SESSION JULY 1921-JULY 1922.

Journal, Botany.

Vol. XLV. No. 304. 12/-

Vol. XLVI. „ 305. 12/-

Journal, Zoology.

Vol. XXXIV. No. 231. 10/-

„ 230. 12/-

Transactions, Zoology.

Vol. X. Part 11 (Index). 3/-

Vol. XVIII. Part 1. 86/-

Proceedings, 133rd Session, November 1921. 6/-

List of [Fellows, Associates, and Foreign Members], Nov. 1921.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND THIRTY-FOURTH SESSION,
1921-1922.)

November 3rd, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 16th June, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. William Edward Hollows was admitted a Fellow.

A certificate in favour of Miss Kathleen Bever Blackburn, M.Sc.(Lond.), was read for the second time.

The following were proposed as Fellows:—

Hugh Fraser Macmillan; Frederick Albert Mitchell-Hedges; Willis Openshaw Howarth, M.Sc.; Benjamin Millard Griffiths, M.Sc.(Birm.); Miss Margaret Collins, B.Sc.(Syd.); Robert Gurney, M.A.; Miss Flora Amelia Gordon; Prof. George Matthai, M.A.(Cantab.); Prof. Edward Hindle, M.A., Ph.D., A.R.C.S.; Herbert Bennett Williamson; Frederick Berry-Lewis Butler; Miss Isabel Soar, Ph.D.(Lond.); Frank Howard Lancum, F.Z.S.; Clive Errol Lord; and Sydney Garside, M.Sc.

Miss Matilda Smith was elected an Associate.

The President announced that there were four vacancies in the List of Fellows, and that a Ballot would be taken to fill those vacancies on the 17th November.

A statement was made from the Chair, announcing the installation of an electric exhaust-fan to aid in the better ventilation of the Meeting Room, and that a new boiler for central heating was in position, and would be available in a few days.

The first exhibition was by Dr. P. TH. JUSTESEN, of photographs of *Rafflesia Arnoldi* taken in Sumatra in 1920. (Communicated by Sir Daniel Morris, K.C.M.G.) The lantern-slides were explained by Dr. A. B. Rendle, F.R.S., Sec.L.S., who also showed the plates illustrating Robert Brown's classical memoir in the 13th volume of the Society's Transactions, a century ago. Mr. H. N. RIDLEY mentioned that he had never seen a flower a yard in diameter as usually quoted, nor of *R. Hasseltii*; as usually met with sporadically in the forest, they were about 18 inches across. The plant is parasitic on vines (*Cissus*); the flower opens early and has a rather faint carrion smell for an hour or two. The Malays call it "Kurubut," almost the same name as they give to *Thottea grandiflora*; it is collected and sold as an astringent.

Dr. A. B. RENDLE showed specimens, bearing fruit, of a hybrid between the sweet orange *Citrus Aurantium* var. *sinensis* and *C. trifoliata*, the wild orange of China and Japan, which had been sent by Mr. Richard H. Beamish, F.L.S., from his garden at Glounthane, Co. Cork. The hybrids between these species are known as Citrange, and have been made with a view to impart the greater hardness of *C. trifoliata* to the sweet orange. The hybrid shows transitions between the unifoliate leaf of the sweet orange and the trifoliate leaf of the other species; it is evergreen like the sweet orange while *C. trifoliata* has deciduous leaves. The fruit, which is larger than in *C. trifoliata*, has a soft hairiness recalling the hairy character of the fruit of that species. Mr. C. C. LACAITA added a few remarks.

The General Secretary then gave an account of the recently-completed Catalogue of the Linnean Herbarium. He stated that his first reference to the Herbarium was made nearly 50 years ago, when he found that Mr. R. Kippist, at that time Librarian, could not explain certain signs employed by Linnæus, the meaning of which had been lost. The speaker's first published contribution to a knowledge of the herbarium was made in 1888, upon the Centenary Anniversary of the Society, when he was commissioned by the President, Mr. W. CARRUTHERS, F.R.S., to draw up an account of the growth of the collections, their purchase by Dr. J. E. Smith, and lastly, their acquisition and tenure by the Society. In turn followed an account of the Banksian desiderata supplied from the Linnean stores; the List of the genera with the number of sheets in each, and the Index issued in 1913. A diversion to the zoological collections came to publication in the next year; then Tulbagh's considerable collection in 1918, and finally the present MS. which had taken more than two years to compile. The guiding idea has been to supply the answer to future enquiries

such as "Who wrote that?" by giving the writer's name to each label or comment, wherever possible, the Linnean letters affording an invaluable help to identifying handwriting. The MS. has been drawn up for reference in after years; it includes the interpretation of many signs used by Linnæus, the meaning of which had been lost for more than a century, but was now rediscovered. Lantern-slides in explanation of these points were shown. (See Supplement.)

Mr. JAMES GROVES presented a paper on Charophyta collected by Mr. THOMAS B. BLOW in Ceylon. He prefaced his remarks by referring to the great services Mr. Blow had rendered in making large collections of these plants in the course of travels in many parts of the world; and to the great beauty and excellence of the specimens, some of which were exhibited, due to Mr. Blow's care and attention in floating them out, in spite of the work having often to be done under very difficult conditions.

Mr. BLOW gave some particulars of the districts visited on each occasion, and of the means of transit, much of which had to be accomplished over rough roads by bullock-cart at a very slow pace, and stated that many of the specimens were obtained from tanks which had been in use when large tracts of country, which are now lying waste, were in cultivation.

Miss HILDA M. COLEY showed thirty drawings of succulent plants from the collection of Mr. W. C. G. Ludford, of Four Oaks, Birmingham, chiefly of *Phyllocactus*, *Cereus*, *Echinocactus*, and *Mamillaria*, with certain Cape plants as *Aloe*, *Gasteria*, *Haworthia*, and *Crassula*.

Dr. A. B. Rendle commented on these admirable drawings.

November 17th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 3rd November, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Certificates for the following were read for the second time:—

Hugh Fraser Macmillan; Frederick Albert Mitchell-Hedges; Willis Openshaw Howarth, M.Sc.; Benjamin Millard Griffiths, M.Sc.(Birm.); Miss Margaret Collins, B.Sc.(Syd.); Robert Gurney, M.A.; Miss Flora Amelia Gordon; Prof. George Matthai, M.A.(Cantab.); Prof. Edward Hindle, M.A., Ph.D., A.R.C.S.; Herbert Bennett Williamson; Frederick Berry-Lewis Butler; Miss Isabel Soar, Ph.D.(Lond.); Frank Howard Lancum, F.Z.S.; Clive Errol Lord; and Sydney Garside, M.Sc.

Norman Douglas Simpson, B.A. (Cantab.), and Douglas Miller Reid were proposed as Fellows.

The following were elected Fellows by ballot:—

Prof. Walter Garstang, M.A., D.Sc. (Oxon.); Walter Sidney Stevens; Miss Winifred Mary Ailsa Lomas, B.Sc.; and William Rae Sherriffs, M.A., B.Sc. (Aberd.).

The President remarked upon a representation of a section of Derbyshire from East to West, executed in samples of the respective rocks by Mr. White Watson, who was elected a Fellow in 1795 and whose death was reported at the Anniversary Meeting of 1837. He was connected with the Post Office and the dispatch of the mails, and in 1794 he prepared the representation above mentioned, issuing also a pamphlet descriptive of it. The British Museum (Natural History) possesses the pamphlet but not the tablet here shown, which measures 19" by 13". As the tablet is somewhat remote from the pursuits of the Linnean Society, the Council has suggested that it would be appropriate to transfer the tablet to the Trustees of the British Museum. It was given to the Society on the 24th May, 1810.

On a show of hands this suggestion was adopted.

The President exhibited a newly-discovered human skull from the Rhodesia Broken Hill Exploration Company's mine in N.W. Rhodesia. It evidently belonged to an extinct race of cave-men, with a skull much resembling that of the European cave-men of the Neanderthal race, but with an erect skeleton.

Prof. E. S. GOODRICH, F.R.S., Sec.L.S., proposed a vote of thanks to the President for this exhibition, the first made before any scientific society; this was accorded by acclamation.

Capt. A. W. HILL, F.R.S., then gave an account of his recent official visit to the Cameroons and Nigeria. He described the settlement of Victoria and gave its history, passing to the Botanic Garden there, having an area of 200 acres, with laboratory, herbarium, and museum buildings, now awaiting restoration to their proper function. The site is admirable, and the soil good; connected with this garden are the experimental plots of tea and cinchona at Buea, at an altitude of 3300–3600 feet on the Cameroon Mountain.

The lecturer then sketched his journey in Nigeria and his visit to the Bauchi Plateau, Northern Provinces, where he had the good fortune to enlist the services of Mr. H. V. Lely, the Forestry Officer of the district, and others for collecting specimens of the local flora. Over 600 specimens have already been received at Kew from Mr. Lely, and so far as they have been determined show a large proportion of new species. The flora of the plateau shows interesting affinities with the flora of Abyssinia and Nyasaland.

The lecture was illustrated by a large series of lantern-slides.

Dr. Stapf, F.R.S., and Dr. Rendle, F.R.S., Sec.L.S., contributed further remarks, and Captain Hill briefly replied.

December 1st, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 17th November, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Certificates for the following were read for the second time :—
Norman Douglas Simpson, B.A.(Cantab.), and Douglas Miller Reid.

Mrs. Alice Sophia Bacon, B.Sc.(Lond.), was proposed as a Fellow.

The President gave notice of a proposed change in the Bye-Laws, enlarging the permissible number of Fellows from 710 to 800.

It was also announced from the Chair that a Dinner would take place after the meeting of the Society on 19th January, 1922.

The first communication was by Prof. W. NEILSON JONES, M.A., entitled "Notes on the Occurrence of *Brachiomonas*" (see Abstract, pp. 57-59).

Sir N. Yermoloff, K.C.B., Dr. E. J. Salisbury, Dr. W. T. Calman, and Mr. H. N. Dixon contributed further remarks, and the author briefly replied.

Mr. J. BURTT-DAVY then gave an account of the distribution of *Salix* in South Africa. He remarked that confusion of species in this region was partly due to the dimorphism of the leaves, those of young shoots being often quite different from the adult leaves. We can recognise in South Africa ten possible species or varieties, and in tropical Africa twelve named species, only one being common to both areas, a form characteristic of the Limpopo River basin, but not crossing the Zambezi; the other nine are strictly endemic, mostly in very limited areas, so that cross-pollination is practically impossible. Usually each species is confined to one particular drainage-basin; where more than one species is found in the same basin, it is due to erosion, the streams being formerly united. Thus the distribution of *S. Woodii* and *S. gariepina* suggest a coast origin and subsequent ascent to the mountains following the erosion of the streams; had it originated on the Drakensberg, the two could hardly have failed to reach the same drainage-basin, as they now occur only fifty miles apart. *S. Woodii* may be the connecting-link by way of

Pondoland, the Transkei, and Eastern Cape with *S. Safsaf* in Rhodesia. Although the Orange River is now isolated from Angola by the wastes of the Kalahari, it is possible that these three species, or a common ancestor, came down from the north during the time when the Cunene discharged into the Orange River by way of the Molopo. A form of *S. Safsaf*, called *S. huillensis*, Seemen, is found on tributaries of the Cunene River.

A discussion followed, in which the President, Dr. Rendle, and Mr. E. G. Baker took part, the author replying.

The last paper was by Mr. MILLER CHRISTY, "The Problem of the Pollination of our British Primulas."

A discussion by Dr. D. H. Scott, Mr. C. C. Lacaita, Mr. T. A. Dymes, Mr. J. Burt-Davy, and Mr. H. R. Darlington followed, and the author replied.

December 15th, 1921.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 1st December, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

A special vote of thanks was passed to Dr. W. RUSHTON PARKER, F.L.S., for his gift of the 'Encyclopædia Britannica,' 11th edition.

A certificate in favour of Mrs. Alice Sophia Bacon, B.Sc.(Lond.), was read for the second time.

The following were proposed as Fellows:—Miss Edith Philip Smith, B.A.(Oxon.), and Miss Elaine Mary Rees, B.Sc.(Lond.).

The President read for a second time the proposed change in the Bye-Laws, Ch. I. § 1, enlarging the number from 710 to 800 Fellows.

It was also announced from the Chair that Ballots would be taken for Fellows on the 19th January and 2nd February, 1922.

The first communication was by Capt. F. A. POTTS, M.A., on the work of the Carnegie Institution in the Marine Biology of Samoa. Photographs of the Island of Tutuila, with its wooded cliffs and enveloping coral-reefs, were shown, and descriptions given of the fish fauna, with illustrations taken under water by officials of the Institution.

The discussion was opened by the President, followed by Dr. G. P. Bidder and Prof. E. S. Goodrich, F.R.S., Sec.L.S., the author replying.

The second communication was a paper by Prof. G. C. BOURNE, F.R.S., on "The Raninidæ, a Study in Carcinology"; and in the absence of the author, was read by Prof. E. S. Goodrich in abstract.

Dr. W. T. Calman, F.R.S., contributed a few further remarks.

January 19th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 15th December, 1921, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Khubchand Isardas Thadani, B.Agr. (Bomb.), M.Sc. (Texas), was proposed as a Fellow.

Certificates in favour of the following were read for the second time:—Miss Edith Philip Smith, B.A. (Oxon.), and Miss Elaine Mary Rees, B.Sc. (Lond.).

The following were elected Fellows:—

Murray Ross Henderson; Miss Kathleen Bever Blackburn, M.Sc. (Lond.); Frederick Albert Mitchell-Hedges, F.R.G.S.; Willis Openshaw Howarth, M.Sc.; and Benjamin Millard Griffiths, M.Sc. (Birm.).

The proposed alteration in Ch. I. § 1 of the Bye-Laws increasing the maximum number of Fellows from 710 to 800 was put to the ballot and carried. The said section now runs as follows:—

Chap. I. Section 1. The number of Fellows shall be limited to *Eight* hundred, exclusive of Honorary Members, Foreign Members, and Associates. The method of Election shall be by Ballot.

The President announced that on the 2nd and 16th of March, 1922, Ballots for Fellows would take place.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., showed a piece of the wood of *Orites excelsa*, R. Br. (family Proteaceæ), one of the Australian Silky Oaks, sent by Mr. T. Steel, of Sydney, N.S.W. The tree, which is a native of northern New South Wales and Queensland, is of unique interest from the deposits of aluminium succinate which occurs in cavities of the wood. Aluminium is very rarely

found in flowering plants and only in small trees; but *Ortes excelsa* absorbs alumina from the soil in large quantities, as shown by analysis of the ash. Occasionally the amount taken up is excessive, in which case the excess is deposited in cavities as a basic aluminium succinate.

In reply to Sir Sidney Harmer, F.R.S., Dr. Rendle stated that this deposit was characteristic of all specimens of this species.

Dr. E. MARION DELF gave an account of research on *Macrocystis* by Miss M. M. MICHELL and herself. After describing the distribution of the alga, the authors reviewed recent accounts of it, and showed lantern-slides in explanation.

The fertile fronds are completely submerged, smooth, dichotomously branched, and usually borne on special shoots. They bear sori on both sides of the frond. Exceptional cases were described of discontinuous sori occurring in the grooves of fronds with wrinkled surface and borne on the long swimming shoots, and usually without a swim bladder at the base.

The zoospores do not appear to have been previously described. Material brought from the shore in the morning, and examined in the laboratory in the evening, showed swarming zoospores; the next morning swimming actively, and more slowly.

Cultures were made from the material in the following way:—About two hours after gathering, the alga was placed in a covered glass dish, with a few cover-slips at the bottom, and then seawater was added. The piece was removed the next day, and 10 days later all the zoospores had come to rest, but showing no sign of germination. Five weeks afterwards short filaments of two different sizes were observed, comparable with the male and female gametophytes in Laminariaceæ reported by Sauvageau and Lloyd Williams. Two months later young stages of the sporophyte were visible on the cover-glasses, a thick-walled empty cell always being at the base of the sporophyte, probably the empty oogonial wall after the escape of the oospore. No sign of the antheridial cells had been noticed. The discovery of the filaments developed from the zoospores and the subsequent growth of the sporophytes from filaments bring it into line with other members of the same family.

The authors consider that the species occurring at the Cape is *Macrocystis angustifolia*, Bory, from its rhizome-like attachments.

A discussion followed, the participants being Miss A. L. Smith, Sir W. A. Herdman, Dr. R. R. Gates, Mr. A. D. Cotton, and Mr. J. Burt-Davy, Dr. E. M. Delf replying.

The next paper was by Mr. J. L. CHAWORTH MUSTERS, entitled "The Flora of Jan Mayen Island," with lantern-slides (communicated by Dr. W. Rushton Parker, F.L.S.).

The flora of Jan Mayen may be divided into four main groups: the floras of the sea-shore, of the bird-cliffs, of sheltered places in the "tundra," and the mountain flora. The most luxuriant

flora, which consists of *Taraxacum* or *Oxyria*, grows either under the bird-cliffs or in places where tuff has been reassorted by water. The limit of flowering plants seems to be about 3000 feet. The total phanerogamic vegetation consists of about 43 species, all of which are common to both Norway and East Greenland. The origin of the flora presents a very complicated problem. Seeds have probably been brought there on the feet of wading birds which migrate to and from their breeding-grounds in East Greenland. It is highly improbable that Jan Mayen has ever been connected with either Iceland or Greenland. Many plants have probably reached Jan Mayen during recent years.

Mr. Frits Johanssen (visitor) and Mr. A. J. Wilmott added further remarks, to which Mr. Musters replied.

February 2nd, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 19th January, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Dr. William Rae Sherriffs, M.A.(Aberd.), was admitted a Fellow.

The following were proposed as Fellows:—Reginald Cory, Hugh Vandevaeas Lely, B.Sc. (Edin.), and Prof. Surendra Chandra Banerji, M.A., B.Sc. (Calc.).

The certificate in favour of Khubchand Isardas Thadani, B.Agr. (Bomb.), M.Sc. (Texas), was read for the second time.

The following were elected Fellows:—Lekshminarayanapuram Subramania Subramaniam, and Hugh Fraser Macmillan.

Mr. FRITS JOHANSSEN then gave an account of the Canadian Arctic Expedition (1913-18), of which he was a member, which started from Vancouver in the 'Karluk' to Nome in Alaska, where local requisites as skins, dogs, and native attendants were procured, and the expedition divided into two parties, the northern and southern. The former under Mr. Stefansson became frozen in on board the 'Karluk' in September, was carried westward, until she was crushed in the ice and sank, in about 73° N. Lat. and 160°-165° W. Long. The party took necessities from the ship and camped on an ice-floe. In attempting to reach land in February 1914, five sailors and three of the scientific staff lost their lives; the party in March reached Siberia, finally reaching Nome in May. The relief ship relieved the party and

brought the scientific collections to Esquimaux in October. Stefansson organised a new search-party after this, by sledge across Banks Land, and later explored Parry Islands, discovering coal in Melville Island. The entire party wintered on Barter Island, 1916-17; further investigations followed, and the expedition reached Nome in August, 1917.

The results were surveys of coasts hitherto unmapped, much geologic material gathered, many fossils, implements used by Esquimaux, with specimens of zoology and botany in quantity; these records are now in course of publication. A series of lantern-slides closed the communication.

The next communication was "Some Statistics of Evolution and Geographical Distribution in Plants and Animals and their Significance," by J. C. WILLIS, M.A., Sc.D., F.R.S., and G. UDNY YULE, C.B.E., M.A., F.R.S.

At the Meeting of the Society on 18th November, 1920, there were shown four closely parallel curves illustrating the percentages of genera belonging to families in order of size, taking the same groups of (10) families for the world, and for various sections of it, including finally the whole of the islands, to which there were 1582 genera confined. These curves are shown in the 'Annals of Botany,' xxxv. (1921) p. 510, and illustrate clearly what may be termed the "hollow curve" of distribution, or curve concave on upper side. The appearance of the curve obtained by plotting series of numbers like this is something as if one had taken a strong steel spring and tried to double it into the angle of a brick wall.

This "hollow curve pattern" of distribution was first noticed in 1912, in the flora of Ceylon, when working it up for the first paper on "Age and Area." It reappeared in 1916 in the curve of distribution of the endemics of New Zealand, which showed a very large proportion of the species in the class which included only those of extremely limited area, with a rapid tapering off to the large areas. It showed still more clearly in the endemics of the Hawaiian Islands, where 47 per cent. of the species occurred on one island only, and 20 per cent. on two (there are 7 chief islands). It came out with complete regularity in every case of distribution that was investigated, whether of endemic species or of non-endemic.

At the same time, investigation of areas showed clearly that, besides "Age and Area," the twin principle which may be called "Size and Space" was also valid.

The hollow curve seems to be an almost universal feature, not only of the geographical distribution, but of the evolution, of plants and animals. The form of the distribution for sizes of genera might be such that the logarithm of the number of genera plotted to the logarithm of the number of species would give a straight line. This law is found to hold fairly closely up to genera of 30-40 species.

The next step was taken when the 1582 endemic genera of islands were divided among their respective islands, when it was found that the sizes of the genera, for *every* island, varied from very many monotypes, through a good many ditypes, to a tail of a few larger genera. On the larger islands, such as Madagascar, this phenomenon was even shown by the individual families.

The general result seems to be to show that evolution and geographical distribution have proceeded in a chiefly mechanical way, the effects of the various "other" factors that intervene—climatic, ecological, geological, etc.—being only to bring about deviations this way and that from the dominant plan. Every family and every genus, and in every country, behaves in the same way. Strong evidence is thus given for De Vries's theory of Mutation, and for Guppy's theory of Differentiation.

Mrs. E. M. REID then followed with her "Note on the Hollow Curve as shown by Pliocene Floras." The material was that published from Tegelen, Castle Eden, etc., the author concluding that fossil floras take their appropriate place alongside living floras, bringing direct evidence from the host to show the universality of the law of Hollow Curve Distribution.

A discussion on these two papers followed, in which the President, Dr. D. H. Scott, Dr. E. J. Salisbury, Prof. R. R. Gates, and Mr. A. J. Willmott took part, Dr. Willis replying.

February 16th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 2nd February, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Surendra Nath Bal, Ph.C., M.Sc. (Mich., U.S.A.), was proposed as a Fellow.

Certificates in favour of the following were read for the second time:—Reginald Cory, Hugh Vandevaes Lely, B.Sc. (Edin.), and Prof. Surendra Chandra Banerji, M.A., B.Sc. (Calc.).

The President announced four vacancies in the list of Foreign Members, occasioned by the deaths of Prof. Otto Bütschli, Prof. Edmond Perrier, Prof. Georg Klebs, and Prof. Johann Wilhelm Spengel.

Prof. R. R. GATES then introduced his paper on "The Inheritance of Flower Size in Plants." He stated that reciprocal crosses were made at Merton in 1912 between *Enothera rubricalyx* and *Æ. biennis*, the former having petals about 40 mm. in length and the latter about 20 mm. in length. The size of flowers in F_1 was intermediate and relatively uniform. In F_2 there was a marked difference in size of flowers, (1) on different plants, (2) in different flowers of the same plant, and (3) sometimes even in the different petals of a flower. More extensive measurements were made on F_2 and F_4 plants. The results show that the hypothesis of several Mendelian factors for length of petal is an insufficient explanation. Variation curves show a tendency to segregation in flower-size between different plants, but also a tendency for the occurrence of smaller flowers, some of the smallest petals being only 7 mm. in length. The disorderly nature of the variation, and the fact that the petals of one flower may be of different lengths, shows that this segregation is not confined to cell-formation, and is not Mendelian. Probably cytoplasmic differences are involved in this type of inheritance and variation.

The communication was followed by a lantern-demonstration and a discussion, in which Lt.-Col. J. H. Tull Walsh and Dr. A. B. Rendle took part, the author replying.

Capt. J. RAMSBOTTOM exhibited a couple of the brilliant golden beetles, *Aspidomorphia sanctæ-crucis*, from Bombay Harbour.

Mr. WILLIAM DALLIMORE, of the Royal Botanic Gardens, Kew, then introduced the subject of the effect produced by wind at Llandudno in causing remarkable dwarfing of trees and shrubs growing on the exposed rocks of the Great Orme's Head, illustrating his remarks by actual specimens and lantern-slides.

A discussion followed, in which the President, Mr. Gerald W. E. Loder, and Mr. Lacaita took part, the author replying.

Mr. J. L. NORTH, of the Royal Botanic Gardens, Regent's Park, then spoke of the possible successful growth of *Glycine Soja*, Sieb. & Zucc., as a profitable crop in this country. He said:—The plants I have upon the table are English-grown specimens of the Soya bean, from a plot at Chiswick in 1921. They are far finer than anything I have seen or grown. Apart from its cultural and commercial importance, the plant has certain characteristics which are the results of Chinese methods of cultivation, and these I should like to point out. One is the peculiar flattening of the branches, the result of close sowing—a method to which the plant has become so accustomed that even when grown wide apart it still retains the habit. Another peculiarity is the fact that if it starts at a wrong angle it twists itself upon its base to bring it into line with the others; this is well illustrated in some of the plants.

I have been experimenting with this variety of Soya since 1913, when I obtained a few seeds of a so-called German

acclimatized plant. Each year since I have worked with the earliest ripening seeds of the previous year, experimenting and testing them in many places, but always with the one idea of hastening the crop—as being the only chance of making it grow in this country. In this I have succeeded to some extent, for whereas my first plants in 1914 did not ripen until November 28th, this last year they had reached a corresponding degree of ripeness early in September—a difference of two months.

Mr. H. R. DARLINGTON asked what was the percentage of oil. The lecturer replied that the percentage of oil was 18 to 21; and then proceeded to give the use to which the Bean was put, which account was supplemented by Mr. H. N. RIDLEY, who mentioned the Soy and “Bean Cheese” of the East, and remarked that the plant flourished best in a dry climate rather than a moist one. He also detailed the fermentation of the bean into commercial soy.

March 2nd, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 16th February, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Rowland Maurice Richards, M.B.E., A.R.C.S., was admitted a Fellow.

Prof. Lucien Cuénot, Nancy; Prof. Gustave Gilson, Brussels; Prof. Jakob Wilhelm Ebbe Gustav Leche, Stockholm; and Dr. Benjamin Lincoln Robinson, Harvard, were proposed as Foreign Members.

The certificate in favour of Surendra Nath Bal, Ph.C., M.Sc. (Mich., U.S.A.), was read for the second time.

The following candidates were elected by ballot:—

Miss Margaret Collins; Robert Gurney; Miss Flora Amelia Gordon; Prof. George Matthai, M.A. (Cantab.); Prof. Edward Hindle, M.A., Ph.D.; Herbert Bennett Williamson; Frederick Berry-Lewis Butler; Miss Isabel Soar, Ph.D. (Lond.); Frank Howard Lancum, F.Z.S., F.E.S.; and Clive Errol Lord.

Mr. H. N. DIXON exhibited a specimen of Burmese Amber, with a moss included in it, probably a species of *Hypnodendron*, C. Muell.

Mr. R. E. HOLTUM spoke of the Flora of Greenland, illustrating his remarks with a series of lantern-slides; an abstract of his remarks, supplied by the author, is appended:—

The writer accompanied Professor A. C. Seward during the summer of 1921 on a visit to Disko Island and the neighbouring parts of the west coast of Greenland. The lantern-slides exhibited are from photographs taken on that expedition, and illustrate some of the vegetation types observed. The most widely-spread vegetation consists of a low heath, the most important species being *Empetrum nigrum*, *Cassiope tetragona*, and other ericaceous plants. In specially protected localities a scrub of *Salix glauca* may be found, which may reach eight feet in height, and accompanying this a luxuriant vegetation of herbaceous plants of southern type. In unfavourable situations the ground is not covered by the vegetation, which consists of isolated plants of resistant herbaceous and woody species. The total flora of the whole of Greenland consists of 416 species of vascular plants, of which 18 per cent. are high arctic in type, 22 per cent. widely distributed, and 60 per cent. of southern type. The problem of the means of arrival of the last-named group after the Glacial period is an interesting one.

Mr. JOHN WALTON followed with remarks on the ecology of the flora of Spitzbergen, as shown in his abstract, which follows:—

From the point of view of numbers of species, the richest flora in Spitzbergen occurs in those places where the nearest approach to Continental conditions is found. Blytt pointed out that arctic plants tend to avoid an oceanic climate. The head of Klaas Billen Bay, one of the branches of the fiord, is situated near the centre of West Spitzbergen, and is included in a small elliptical area of about 5000 sq. kilometres, which Nathorst has shown to contain 90 per cent. of the species of vascular plants occurring in Spitzbergen. The area around Bruce City, at the head of Klaas Billen Bay, can be divided roughly into three vegetational zones:—Raised Shingle Beach, Alluvial Land between mountain and beach, and Scree Slopes. The land is rising relatively fast from the sea, and the development of the flora of Alluvial Land and Raised Shingle Beach can be traced from initial stages in an intertidal zone. This intertidal zone shows many points of resemblance to the salt-marsh formation of lower latitudes.

Prof. A. C. SEWARD, F.R.S., who communicated both papers, opened the discussion by remarking that his main object was the collection of fossil plants. He recommended Greenland as a summer resort, the only difficulty being getting there; and referred to Dr. Porsild's work in establishing a scientific station within the Arctic Circle.

The President, Mr. E. G. Baker, Dr. J. R. Leeson, Mr. C. E. Salmon, Mr. J. Burt-Davy, Mr. T. A. Sprague, Mr. T. A. Dymes, and Prof. F. E. Weiss, F.R.S., joined in the discussion, and the authors replied.

Sir W. A. HERDMAN, C.B.E., F.R.S., followed with his "Spolia Runiana, V.—Summary of Results of Investigation of the Plankton of the Irish Sea during fifteen years."

Sir Nicolas Yermoloff, K.C.B., Mr. W. S. Rowntree, and Mr. C. C. Lacaíta joined in a discussion, the author replying.

March 16th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 2nd March, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President announced that the Council had fixed the dates of 4th May and 1st June for ballots.

It was also announced from the Chair that, as an experiment, the Library (only) will remain open till 9.0 P.M. after the four remaining General Meetings of the present Session.

Mr. William Narramore, Mr. Frank Howard Lancum, Miss Isabel Soar, Ph.D., and Mr. William Williamson were admitted Fellows.

George Valentine Chapman Last was proposed as a Fellow.

The certificates in favour of the four naturalists proposed as Foreign Members on the 2nd March were read for the second time.

The following were severally balloted for and elected Fellows:—

Sydney Garside, M.Sc.; Norman Douglas Simpson, B.A. (Cantab.); Douglas Miller Reid; Mrs. Alice Sophia Bacon, B.Sc. (Lond.); Miss Edith Philip Smith, B.A. (Oxon.); Miss Elaine Mary Rees, B.Sc. (Lond.); Khubchand Isardas Thadani, B.Ag. (Bomb.), M.Sc. (Texas); Reginald Cory; Hugh Vandevaes Lely, B.Sc. (Edin.); and Surendra Chandra Banerji, M.A. & B.Sc. (Calc.).

The Rev. F. C. R. JOURDAIN, M.A., M.B.O.U., then gave a lantern demonstration of the bird-life of Bear Island and Spitzbergen, with a description of the Oxford Expedition to those regions in 1921.

The President, Dr. W. Rushton Parker, and Lt.-Col. Tull Walsh joined in the discussion following the exhibition.

Mr. B. MILLARD GRIFFITHS's paper "The Heleoplankton of three Berkshire pools" was, in the absence of the author, read in title.

Mr. C. E. SALMON showed several sheets from his herbarium of the undermentioned plants and commented upon them.

1. *Sagina filicaulis* Jord. Obs. Frag. vii. 16 (1849), closely allied to *S. apetala* and *S. ciliata*, differing from the former by its sepals tapering and two usually mucronate, and also by their being appressed to the ripe capsule; from the latter by being more glandular, sepals less acute, and shorter in proportion to the ripe capsule.

2. *Cerastium subtetrandrum* Murbeck in Bot. Notiser, 1898, 259. This occurs in Orkney, sent by Col. H. H. Johnston, F.L.S., and reported from W. Sutherland by Dr. G. C. Druce, F.L.S. From *C. tetrandrum* it differs by being both pentamerous and tetrandrous, its floriferous part being higher up the stem, the lower bracts smaller than the stem-leaves, sepal tips drawn out into membranous, acute points, and seeds smaller.

3. *Arum italicum* Mill. A rare British plant only found in Cornwall, Dorset, Hants, Sussex, and Kent; but also in the Channel Islands. The following notes are taken from Sussex specimens. They differ from *A. maculatum* by the petioles being much longer in proportion to the blade, spathes longer compared with spadix, ovaries more numerous, rudimentary flowers with bases not tapering into filaments, and the spadix is differently shaped as well as larger. The leaves are not so well marked with white veins as in Continental specimens. They show above ground in late autumn or winter, whilst *A. maculatum* is much later.

Further remarks were contributed by Mr. H. N. Ridley, Mr. C. C. Lacaita, Mr. H. W. Pugsley, and Dr. E. J. Salisbury, and Mr. Salmon briefly replied.

April 6th, 1922.

Mr. HORACE W. MONCKTON, Treas. & V.-P.,
in the Chair.

The Minutes of the General Meeting of the 16th March, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Miss Flora Amelia Gordon; Prof. Walter Garstang, M.A., D.Sc. (Oxon.); Miss Kathleen Bever Blackburn, M.Sc. (Lond.); Miss Winifred Mary Ailsa Lomas, B.Sc.; and Mr. Benjamin Millard Griffiths, M.Sc. (Birm.), were admitted Fellows.

Mr. Percy Hutchinson Lamb was proposed as a Fellow.

The certificate in favour of George Valentine Chapman Last, M.R.C.S., L.R.C.P., Ph.C., was read for the second time.

The certificates in favour of Prof. Lucien Cuénot, Prof. Gustave Gilson, Prof. Jakob Wilhelm Ebbe Gustaf Leche, and Dr. Benjamin Lincoln Robinson, proposed as Foreign Members on the 2nd March last, were read for the third time.

The following were proposed as Auditors for the Treasurer's Accounts for the current financial year ending on the 30th instant, and were elected by show of hands:—For the Council: Mr. Stanley Edwards, and Mr. G. W. E. Loder, M.A.; for the Fellows: Mr. H. R. Darlington, M.A., and Mr. H. N. Ridley, C.M.G., M.A., F.R.S.

The first communication was by Dr. A. B. RENDLE, F.R.S., Sec.L.S., who showed a seedling of the Red Horse-chestnut (*Æsculus rubicunda*) in which a new terminal bud had been developed to replace the original shoot (plumule) springing from the seed. The original main shoot (epicotyl) had been broken some distance below the plumule; but after a few days a new growth was seen to have covered up the broken section, and gradually to develop into a new terminal bud. The new bud did not resemble the plumule, which produces at once a pair of large compound leaves of a similar character to the adult foliage, but suggested a normal terminal bud the outer leaves of which are imperfect, the leaves of the perfect form being protected in the interior of the bud. Adventitious buds are very common in plants, but the speaker did not know of a similar case of direct replacement of the plumule as the result of injury.

Mr. T. A. Dymes and Mr. H. N. Dixon contributed further remarks, Dr. Rendle replying.

The next communication was a paper by Mr. L. A. BORRADAILE, M.A., communicated by Prof. E. S. Goodrich, F.R.S., Sec.L.S., entitled "The Mouth-parts of the Shore Crab, *Carcinus menas*," illustrated by a series of lantern-slides.

Sir Sidney Harmer, K.B.E., F.R.S., Lt.-Col. J. H. Tull Walsh, Prof. W. Garstang, and Prof. Goodrich, F.R.S., Sec.L.S., took part in the discussion which followed, and the author replied.

The last paper was by Mr. CHARLES TURNER, F.C.S., on "The Life-History of *Staurastrum Dickiei*, var. *parallelum* (Nordst.)," and was communicated by the General Secretary. (See Abstracts, p. 59.)

Dr. A. B. Rendle and the Chairman contributed further remarks on the interest of the subject of the paper, which was illustrated by numerous lantern-slides.

May 4th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 6th April, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Prof. John Lloyd Williams, D.Sc., Miss Elaine Mary Rees, B.Sc. (Lond.), Miss Edith Philip Smith, B.A. (Oxon.), Mr. Percy Appleyard, F.C.S., Mr. Douglas Miller Reid, Mr. Edwin Ashby, and Mr. Sydney Garside, M.Sc., were admitted Fellows.

A certificate in favour of Percy Hutchinson Lamb was read for the second time.

Cecil Victor Boley Marquand, M.A. (Cantab.), and Charles Turner, F.C.S., were proposed as Fellows.

Prof. Lucien Cuénot, Prof. Gustave Gilson, Prof. Jakob Wilhelm Ebbe Gustaf Leche, and Dr. Benjamin Lincoln Robinson were balloted for and elected Foreign Members.

Mr. EDWIN ASHBY exhibited pressed specimens of Orchids from South Australia including a number of the "spider-like" members of the genus *Caladenia*, and the green-hooded forms of the genus *Pterostylis*: many of these have a sensitive labellum which on the entrance of an insect closes up the opening for a short period: Mr. Ashby suggested that this was for the purpose of fertilization. A member of the genus *Thelymitra*, which only open their bright-coloured petals in hot bright sunshiny days, and two species of *Caleya* were exhibited, both extremely local in that state, and both provided with a sensitive labellum, which, on being touched, folds up in two separate movements.

A species of *Diuris* intermediate between *D. maculata* and *D. longifolia*, although now a fixed form, seems certainly to have been derived by hybridization. For many years before it was described by Dr. Rogers as *Diuris palachila*, Mr. Ashby had known it under his own name of *hybrida*, thinking it could hardly deserve specific rank.

A very beautiful form known as *Caladenia tutelata*, R. S. Rogers,

intermediate between the genera *Glossodia* and *Caladenia*, was shown and its characters explained.

Dr. A. B. Rendle, F.R.S., Sec.L.S., and Prof. F. W. Oliver, F.R.S., contributed further remarks, and Mr. Ashby replied.

The General Secretary read "A Relic of Henry Lyte's Library," a statement by Mr. HAROLD DOWNES, M.B., F.L.S., who presented an association volume from the library of HENRY LYTE (1529-1607) of Lytes Cary, Somerset.

"The volume which I have the honour of offering to the Society was discovered by myself in 1916 in a general dealer's shop in Taunton. It consists of two works of Antoine Mizauld, the French Physician (1520-1578), 'Alexikerus' and 'Nova et Mira Artificia,' bound together (Paris, 1564).

"The interest for us lies in the fact that the volume in question formed an item in the Library of Henry Lyte, and contains his autograph and various notes in his handwriting. At the top of the title-page of 'Alexikerus,' in red ink, is the signature "Henry Lyte," and across the printer's device (a mulberry tree) is "Henry Lyte, 1565." The signature is repeated on the title-page of the second work. A few trifling marginal notes are scattered through the volume, and many passages are underlined, the notes and under-scorings, as well as the signatures, being in red ink. At the end of the volume are two pages of MS. notes, mostly medical definitions or short descriptions of diseases. A list of Mizauld's works is printed at the end of the volume, and several of these are marked "H," which I assume to stand for "Habeo," and to indicate that Lyte possessed them. All the above are in Lyte's neat handwriting, as may easily be proved by comparison with specimens of his handwriting in the British Museum and elsewhere.

"As is well known, Henry Lyte was the translator of Dodoens's Herbal, the first edition of the translation being dated 1578. The French copy of "Dodoens" which Lyte used for this translation is in the British Museum, and contains copious notes in his handwriting. Henry Lyte was a member of the ancient family of Lyte of Lytes Cary, in Somersetshire. According to Pulteney he became a student of Oxford in 1546. He afterwards travelled, and at length retired to his estate, where he devoted his time to study, publishing several works of a historical character. He possessed a botanical garden, of which no trace remains. Contemporary with Turner, the latter was considerably his senior, and though they were near neighbours there seems no evidence that they held any communication, on botanical or other subjects. Lyte was twice married, and died in 1607 at the age of 78, being buried at Charlton Mackerel in his native county.

"The MS. notes in the volume under consideration were transcribed by me in 'Somerset and Dorset Notes and Queries,' 1917, of which a reprint will be found in the Society's Library."

BIBLIOGRAPHY:—

- Pulteney, Richard. Progress of Botany, 1790.
- Lyte, Sir H. C. Maxwell. The Lytes of Lytes Cary. (Proc. Somerset Arch. and Nat. Hist. Soc., 1892.)
- George, William. Lytes Cary Manor House, Somerset. Bristol, n. d.
- Arber, Agnes. Herbals: Their Origin and Evolution. Cambridge, 1912.
- Downes, Harold. Henry Lyte of Lytes Cary. (Somerset and Dorset Notes and Queries, 1917.)

The President moved a vote of thanks to Mr. Downes for presenting this interesting volume to the Society's Library.

Prof. J. LLOYD WILLIAMS, D.Sc., then gave an account of the Life-history of *Laminaria* and *Chorda*, illustrated with about 40 lantern-slides.

He remarked that up to a few years ago, Botany Students were taught that the Laminariaceæ, though they exhibit the highest advance in their external morphology and internal structure, possessed no method of sexual reproduction, but propagated themselves by means of asexual zoospores; and consequently they had to be classed, not with the higher, oogamous members of the Phæophyceæ, but with the lower Phæozoosporeæ. The recent discovery of the development from germinating zoospores of two kinds of gametophytes, producing respectively eggs and antherozoids, compels us to revise our ideas respecting the group and its systematic position.

The Author, after describing in detail the structure of the zoospore, its behaviour in germination, and the cytology of the processes, stated that cultures of *Laminaria* three weeks old, and of *Chorda*, three or four months old, almost invariably showed the presence of two kinds of multicellular germlings, one kind large-celled, the other consisting of cells many times smaller. Sauvageau, by observing the development in his culture of abnormal sporangia of *Saccorhiza*, was able to prove that both kinds of germlings were produced from zoospores in the same sporangium. All attempts at carrying the discovery further by observing the actual liberation of the sexual cells failed until two years ago, when the Author witnessed the discharge of antherozoids and the process of fertilization. Lantern-slides were exhibited showing the two gametic nuclei within the eggs a little before fusion, and by comparison with the appearance of the sporophyte rudiment immediately after the first division of its fusion nucleus it was shown that the one condition can never be mistaken for the other.

The process of dehiscence of the oogonium and the liberation of the egg were explained in detail, and the difference between the behaviour of the inner wall in *Laminaria* and *Chorda* explained.

The Author had previously shown that Drew's supposed discovery of the sexual nature of the "Zoospores" was incorrect, but

as some botanists still believe in it, additional evidence was adduced showing that the organisms described by him could not possibly have been the zoospores of *Laminaria* but must have been colourless monads. The Laminariaceæ thus show distinct alternation of generations: the plant is the sporophyte; reduction of chromosomes takes place in the sporangium; there are two kinds of gametophytes—a male and a female, and the difference in size between the generations is exceedingly great. The sporophyte may be gigantic, as compared with other algæ, whereas the gametophyte is microscopically small.

In the discussion which followed, Dr. D. H. Scott, F.R.S., Prof. R. R. Gates, Dr. Marion Delf, Dr. Lily Batten (visitor), and the President took part, the author replying.

May 24th, 1922.

Anniversary Meeting.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 4th May, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mrs. Alice Sophia Bacon, B.Sc.(Lond.), was admitted a Fellow.

Certificates were read for the second time in favour of Cecil Victor Boley Marquand, M.A.(Cantab.), and Charles Turner, F.C.S.

Major Charles Hunter, M.Sc.(Durh.), and William Nowell, D.I.C., were proposed as Fellows.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 24-26), duly audited, was received and adopted.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely:—

12 Fellows.

Prof. William Beecroft Bottomley.	Dr. Walter George Ridewood.
Prof. George Simonds Boulger.	William D. Robinson-Douglas.
The Rt.Hon. Henry John Moreton,	Rev. Canon Frederick Charles
Earl of Ducie, P.C., G.C.V.O.	Smith.
John Firminger Duthie.	John Thomas Norman Thomas.
Dr. John Harley.	Major Charles Vipar, D.S.O.
Sir John Kirk, G.C.M.G., K.C.B.	Rev. Edward Adrian Woodruffe- Peacock.

3 Foreign Members.

Prof. Georg Albrecht Klebs.	Prof. Johann Wilhelm Spengel.
Prof. Jean Octave Edmond Perrier.	

That the following 11 Fellows had withdrawn :—

Sir Alfred Gibbs Bourne, K.C.I.E.	John Beavis Groom.
Dr. Horace Tabberer Brown.	Edwin Ernest Lowe.
Capt. Malcolm Burr.	Rev. Sir James Marchant.
William Miller Christy.	Charles John Cowper Mee-
Francis Joseph Clark.	Power.
Arthur John Fry Gibbons.	Miss Edith Grey Wheelwright.

During the same period 48 Fellows have been elected, of whom 39 have qualified up to the present. Also 4 Foreign Members and 1 Associate have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 92 volumes and 594 pamphlets and parts, by exchange 179 volumes and 711 detached parts, by purchase 69 volumes and 291 parts; in all, the accessions amounted to 340 volumes and 1596 pamphlets and separate parts. Books bound amounted to 411: 50 in half-buckram, 149 in cloth, and 16 rebound.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to vote for the Council.

The Ballot for the Council having been closed, the President appointed Commander Walker, Mr. W. S. Rowntree, and Mr. A. W. Sheppard, Scrutineers; and these, having examined the ballot-papers and cast up the votes, reported to the President, who declared the result as follows :—

Prof. MARGARET BENSON, D.Sc.; *Dr. GEORGE P. BIDDER, M.A.; E. T. BROWNE, M.A.; *Dr. WM. THOS. CALMAN, F.R.S.; *Prof. FELIX E. FRITCH, D.Sc.; Prof. E. S. GOODRICH, F.R.S.; Prof. Dame HELEN GWYNNE-VAUGHAN, D.B.E.; Sir SIDNEY F. HARMER, K.B.E., F.R.S.; *Dr. ARTHUR WM. HILL, F.R.S.; Dr. B. DAYDON JACKSON; GERALD W. E. LODER, M.A.; HORACE W. MONCKTON, F.G.S.; *FRANK A. POTTS, M.A.; Capt. JOHN RAMSBOTTOM, M.A.; Dr. A. B. RENDLE, F.R.S.; The Rt. Hon. LIONEL WALTER, BARON ROTHSCHILD, F.R.S.; Dr. E. J. SALISBURY; CHARLES EDWARD SALMON, Esq.; THOMAS ARCHIBALD SPRAGUE, B.Sc.; and Dr. A. SMITH WOODWARD, F.R.S.

(New Councillors are shown by an asterisk. The retiring Councillors were: Prof. V. H. BLACKMAN, F.R.S.; HENRY BURY, M.A.; STANLEY EDWARDS, F.Z.S.; C. C. LACAITA, M.A.; and R. I. POCKOCK, F.R.S.)

The Ballot for the Officers having been closed in like manner, the President appointed the same Scrutineers, who having examined the ballot-papers and cast up the votes, reported the same to the President, who declared the result as follows :—

President. Dr. ARTHUR SMITH WOODWARD, F.R.S.

Treasurer. HORACE W. MONCKTON, F.G.S.

Secretaries. Dr. B. DAYDON JACKSON.
Prof. E. S. GOODRICH, F.R.S.
Dr. A. B. RENDLE, F.R.S.

The President then delivered an Address on “Observations on Crossopterygian and Arthrodiran Fishes,” illustrating them by lantern-slides, in continuation of previous addresses (see p. 27).

TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1922.
(Presented at the Anniversary Meeting, May 24th, 1922.)

Receipts and Payments of the Linnean Society from May 1st, 1921, to April 30th, 1922.

General Account.

<i>Receipts.</i>		<i>Payments.</i>	
	£ s. d.		£ s. d.
To Balance at Bankers on 1st May, 1921	463 16 6	By Taxes and Insurance	29 16 4
" Cash in hand	7 10 11	" Repairs and Furniture (includes Electric Fan	
" Interest on Investments	371 8 7	£171 2 10, New Boiler £121 1 0, Lantern	
" Admission Fees	252 0 0	£59 11 0)	424 18 7
" Annual Contributions	2116 0 0	" Coal, Electric Current, and Gas	126 2 1
" Sales of Publications:—		" Salaries	939 0 4
Transactions	£8 1 3	" Library:—	
Journals	166 15 8	Books (New Books £37 17 3).....	£179 9 1
Proceedings and Catalogues	5 3 6	Binding.....	129 1 0
	180 0 5	" Expenses of Publications:—	
" Fellows' postal account, deposits	12 7 3	Printing	£728 7 7
" Donations in aid of Publications	278 10 0	Illustrations	127 18 7
" Miscellaneous Receipts	28 9 6	Distribution	47 8 0
" Transfer from Separate Account	58 13 0	" Miscellaneous Printing and Stationery	
		" Petty Expenses (including Tea and	
		Postage)	£114 13 0
		" Fellows' postal account	6 15 4
		" Linnean Medal	
		" Purchase of £200 Midland Railway	
		2½ % Consolidated Perpetual Pref-	
		erence Stock	
		" Balance at Bankers, 30th April, 1922	£511 6 5*
		Do. deposits, Fellows'	
		postal account	114 0 3
		" Cash in hand	4 7 10
			629 14 6
			<u>£3798 16 2</u>

* £425 already allocated for printing in hand.

Separate Account.

	£	s.	d.
To Balance at Bankers, 1st May, 1921 :—			
Westwood Fund	£	8	18
Trail Award Fund		6	0
Crisp Award Fund		26	16
Hooker Lecture Fund		41	8
Tagart Fund		14	12
Goodenough Fund		17	16
Library Catalogue Fund		1	0
Annual Dinner Fund		4	0
Compounders' Donation Fund ..		117	1
Donations :—			
Library Catalogue Fund		10	0
Tagart Fund		16	0
Annual Dinner Fund Receipts			
Compounders' Donation Fund			
Interest on Investments :—			
Westwood Fund	£	8	19
Trail Award Fund		3	12
Crisp Award Fund		7	0
Hooker Lecture Fund		22	3
Tagart Fund		20	16
Goodenough Fund		4	7
		67	0
		4	4
		£	413
		6	10

Investments on April 30th, 1922.

£	s.	d.	General Account.	Value, 30th April, 1922.	£	s.	d.
450	0	0	North Bridge Railway 4 per cent. Stock	@ 83	373	10	0
1000	0	0	Metropolitan Consolidated 3 per cent. Stock	@ 77	770	0	0
1200	0	0	India 3 per cent. Stock	@ 58	696	0	0
1000	0	0	Eastern Bengal Railway 4 per cent. Debenture Stock	@ 67 $\frac{1}{2}$	675	0	0
1000	0	0	Great Western Railway 4 per cent. Debenture Stock	@ 85 $\frac{1}{2}$	855	0	0
500	0	0	Midland Railway 2 $\frac{1}{2}$ per cent. Consolidated Perpetual Preference Stock	@ 53	265	0	0
3200	0	0	5 per cent. War Loan, 1923-47	@ 99 $\frac{1}{2}$	3184	0	0
					£6818	10	0

PRESIDENTIAL ADDRESS, 1922.

OBSERVATIONS ON CROSSOPTERYGIAN AND ARTHRODIRAN FISHES.

AMONG the scientific contemporaries of Linnæus there were some who failed to realise the influence which his 'Systema Naturæ' was destined to have on the future progress of biology. Of these perhaps the most famous was the Dutch anatomist, Peter Camper, the bicentenary of whose birth falls within the present month. He not only published criticisms of part of Linnæus' systematic work, but also had so little appreciation of the important advance made by his new scheme of classification and nomenclature that he would scarcely admit it to be science. When he was invited to become a Foreign Member of this Society in 1788, he even refused to do so on the ground that he could not be associated with any institution which was named after Linnæus. Camper's original letter, which is still in the archives of the Society, is written in terms so emphatic that there can be no mistake as to his meaning. The lack of mutual appreciation between comparative anatomists and systematists, which has sometimes been manifest in later years, evidently dates back to the beginning of the new era inaugurated by Linnæus himself, and even at that time tended to prevent co-operation.

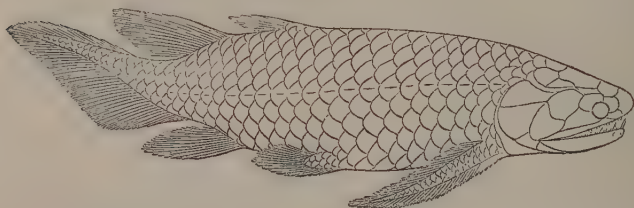
There is no subject in which the combined resources of the comparative anatomist (now morphologist) and the systematist are more needed than the interpretation of the links which lived in the Devonian period between the fishes and the early amphibians, which were then appearing. They are very different from the forms which might have been anticipated, had we been able to deduce them solely from a knowledge of the existing fauna. They therefore afford an interesting illustration of the importance of the study of fossils as an aid to understanding the life of the present day.

It has long been recognised that, among existing animals, the Dipnoan fishes, *Lepidosiren*, *Protopterus*, and *Ceratodus*, are most nearly intermediate between fishes and amphibians; but we now learn from fossils that the Dipnoi have remained essentially unchanged since their earliest known occurrence in the Middle Devonian*. They have in the interval merely abandoned the fusiform shape which is adapted for free-swimming life, and have become more or less eel-shaped in adaptation to a wriggling and grovelling existence at the bottom of the rivers to which the last survivors retreated by the end of the Mesozoic era. They are therefore excluded by the nature of their dentition, their head-bones and other characters, from consideration as the possible ancestors of the Stegocephala (or "Labyrinthodonts"), which were the first amphibians. They may have arisen at the same time from a common stock—they probably did so,—but no links have been discovered between them and any true air-breathers.

* L. Dollo, Bull. Soc. Belge Géol. vol. ix. (1895), pp. 79-128, pls. v.-x.

The real links in question, so far as we know them, are among the extinct paddle-finned fishes (fig. 1) which Pander and Huxley regarded as belonging to the same group as the existing *Polypterus* and *Calamoichthys*. The fishes of this group (Crossopterygii*) have indeed changed greatly in progress of time, and the further back they are traced the more nearly do they approach the early amphibians, which appeared very little later than themselves. If the existing *Polypterus* and *Calamoichthys* alone were known, the relationship would be scarcely evident; for they are typically "mature" or even "senile" forms of the group, with an elongated body, modified cheek-plates, completed vertebræ, and highly specialised fins. The primitive Devonian genera, however, exhibit resemblances which are unmistakable and have long been

Fig. 1.



An Upper Devonian Crossopterygian, *Holoptychius flemingi*, restored by Dr. R. H. Traquair, about one-eighth nat. size.

noticed†. The enlarged conical tusks on the vomerine bones, and in fact the whole appearance and arrangement of the teeth, resemble those of the typical Stegocephala. The peculiar structure of the teeth, with a more or less complex folding of the walls of dentine, is also nearly the same in the two groups. The complexity of the mandible in the early Crossopterygian fishes is much like that in the Stegocephala, and the symmetrically arranged dermal plates of the skull and cheeks correspond very closely. Some of the Crossopterygians, such as *Osteolepis*‡ and *Diplopterus*, exhibit a pineal foramen, exactly as in all the Stegocephala. Some of them, such as certain Rhizodonts and Coelacanth, also agree with the Stegocephala in having sclerotic plates round the eye. Finally, it is to be noted that the earliest Stegocephala have the pterygoid bones extended and nearly as large as those of the Crossopterygii§, the reduced pterygoids with

* T. H. Huxley, Figs. & Descript. Brit. Organic Remains, dec. x. (Mem. Geol. Surv. 1861), p. 24.

† A. S. Woodward, 'Outlines of Vertebrate Palæontology' (1898), p. 123, fig. 81.

‡ E. S. Goodrich, Journ. Linn. Soc., Zool. vol. xxxiv. (1919), pp. 181-188.

§ D. Embleton & T. Atthey, Nat. Hist. Trans. Northumb. & Durham, vol. v. (1877), p. 207, pl. ii. (*Lowomina allmanni*), and p. 319, pl. vii. (*Anthracosaurus russelli*); D. M. S. Watson, Mem. & Proc. Manchester Lit. & Phil. Soc. vol. 57 (1912), no. 1.

large interpterygoid vacuities only appearing at the beginning of the Permian period.

As in so many cases of links among extinct animals, however, the known series is far from being complete. The Crossopterygii hitherto found have the upper jaw suspended to the cranium, while even the earliest Amphibia exhibit it directly fused with the cranium. As the Dipnoi among fishes show the same fusion of the upper jaw, they were for some years placed nearest to the Amphibia; but recent studies suggest that the fused (or autostylic) condition has arisen more than once as a mechanical adaptation to the working of powerful teeth, and it may be predicted that definite links between Crossopterygian and Amphibian jaws will sooner or later be discovered.

More difficult to understand are the differences which have lately been recognised in the basiscranial axis. In the earliest known Amphibia, the Stegocephala, just as in those now existing, the basiscranial axis, with its large parasphenoid bone, extends backwards as far as the occiput. In the Devonian and later Palæozoic Crossopterygii, and in the Cœlacanth family which survived until the Cretaceous period, this axis, underlain by the parasphenoid, extends backwards only so far as a point beneath the hinder margin of the frontal bones where there is always a transverse line of weakness in the cranial roof. At this point it ends abruptly, and its termination, round in transverse section, is impressed behind with a conical hollow for the notochord, as if it were the basioccipital itself. There is no doubt, indeed, that the fully developed notochord, surrounded only by non-ossified cartilage, extended as far forwards as this point, which appears to have been close to the pituitary region. The condition of the basal part of the skull in the adult early Crossopterygii thus corresponds closely with the temporary embryonic condition of the same part in a modern fish-skull. The arrangement has been clearly seen in several specimens of the Upper Devonian *Holoptychius* and the Carboniferous *Megalichthys*, but it is especially well-known in *Eusthenopteron* (fig. 2) from the Upper Devonian of Canada, in which the ossified otic-occipital region has also been observed*. It is equally clear in the Devonian and the Cretaceous genera of the family Cœlacanthidæ†.

Between some of the Crossopterygii and some of the Stegocephala there is not much difference in the vertebral axis. The reduction and concentration of the median fins towards the end of the tail in the early Crossopterygii (fig. 1) may be regarded as marking the beginning of the disappearance of these structures. The links between the paired fins of the Crossopterygii and the four- or five-toed limbs of the Stegocephala, however, are still wanting. It can only be stated that the cartilages in some of the short-lobed fins, such as those of *Eusthenopteron*, approach more

* W. L. Bryant, Bull. Buffalo Soc. Nat. Sci. vol. xiii. (1919), pp. 6-19, pls. ii.-x.

† E. A. Stensiö, Palæont. Zeitschr. vol. iv. (1922), pp. 167-210, pls. iii.-v.; D. M. S. Watson, Ann. & Mag. Nat. Hist. [9] vol. viii. (1921), pp. 320-337.

closely those of an amphibian limb than the fin-structures of any other known fishes. Interesting suggestions as to their possible homologies have been made*, and we may eventually discover the actual links among the Lower Carboniferous Stegocephala, of which only unsatisfactory fragments of the limbs have hitherto been seen.

It is reasonable to suppose that at the time when the Amphibia originated, there were among the fishes other abortive groups besides the ordinary Dipnoi which approached the higher grade. Among these I have long placed the curious armoured Devonian fishes which are now generally known as Arthrodira†. I have,

Fig. 2.



Crushed remains of the palate of *Eusthenopteron foordi*, from the Upper Devonian of Scaumenac Bay, Canada, one-half nat. size. The shape of the cranial roof, preserved on the opposite side of the slab, is shown in dotted outline. *bc.* basieraminal axis with hollowed hinder end; *ecpt.* ectopterygoid; *enpt.* entopterygoid; *mpt.* metapterygoid; *pal.* palatine; *qu.* quadrate; *vo.* vomer. (Brit. Mus. no. P. 6807.)

indeed, hitherto followed Newberry in regarding them as aberrant Dipnoi, but new fossils have convinced me that they belong to a distinct group and have not an autostylic skull.

The general appearance of the skeleton in the Arthrodira is best known from the specimens of a small species of *Coccosteus* (fig. 4 A) found in the Old Red Sandstone of Northern Scotland. The head is completely encased in bony plates, and the jaws

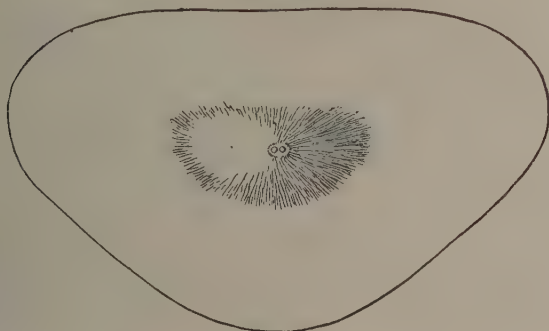
* W. K. Gregory, Ann. New York Acad. Sci. vol. xxvi. (1915), pp. 353-369, pl. iv.

† A. S. Woodward, Catal. Foss. Fishes Brit. Mus. pt. ii. (1891), pp. 276-316, pls. vii., viii.; L. Hussakof, Mem. Amer. Mus. Nat. Hist. vol. ix. (1906), pp. 150-154, pls. xii., xiii.

are powerful cutting structures. The armour of the head is hinged at each side on the similar bony armour which encircles the anterior part of the trunk. The notochord must have been persistent, but the closely-set neural and hæmal arches are superficially calcified. The paired fins seem to have been present, though they are rudimentary. The median fins, of which only one small dorsal and remains of the caudal have been seen, are mere membranes without hard fin-rays. The supports of the dorsal fin are in double series, and directly supported by an equivalent number of neural arches beneath them, as in the *Dipnoi* and the earliest sharks.

The condition of the dorsal fin suggests that the *Arthrodira* are very primitive fishes, and it is interesting to note that they exhibit some other features which confirm this impression. It suffices to refer to the importance of the pineal organ of the

Fig. 3.

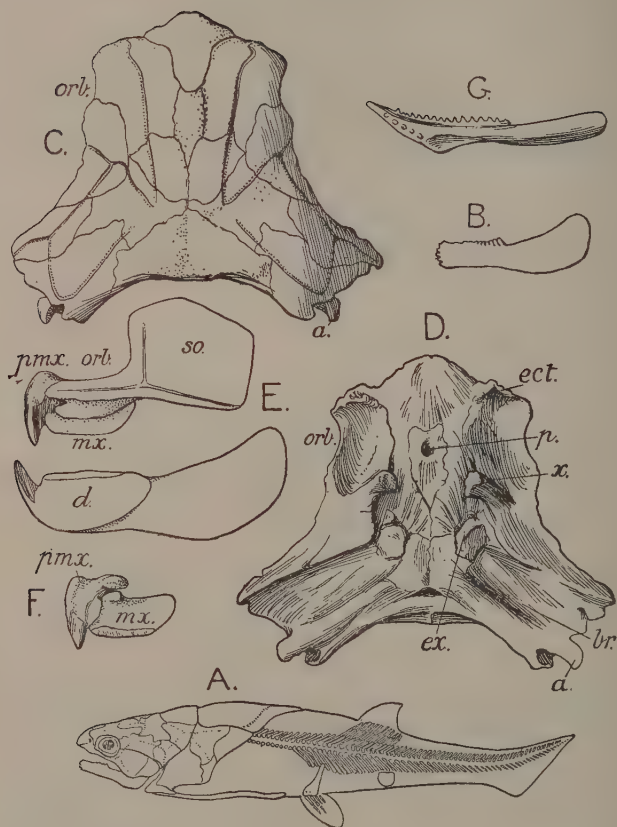


Pineal plate of *Titanichthys*, from the Upper Devonian of Ohio, U.S.A., inner view, one-half nat. size. The paired pineal pits or openings are seen in the middle area of thickened bone. (Brit. Mus. no. P. 9304.)

brain. In all head-shields in which the impression of this organ has been observed, there is a curious thickening of the surrounding bone, sometimes indeed an excessive thickening. The pit thus formed seems to end blindly, not opening to the exterior by a pineal foramen. As a rule it is single and must have lodged an ordinary simple pineal organ; but in *Titanichthys* (fig. 3), as now known from three or four specimens, the pit is distinctly paired for the accommodation of a symmetrically paired pineal organ. Prof. Dendy and others have already inferred from the facts of embryology that the pineal must have been originally a paired structure. *Titanichthys* is sufficiently near the beginning of the chordate series actually to show it.

The skull in the *Arthrodira* is very difficult to interpret, because most of the cartilages seem to have remained unossified.

Fig. 4.



Osteology of Arthrodira. A. Restoration of *Coccoosteus decipiens*, side view, from the Middle Old Red Sandstone of Scotland, nearly one-quarter nat. size. B. Dentary bone of same. C. D. Head-shield of *Dinichthys intermedius*, upper and lower view, from the Upper Devonian of Ohio, U.S.A., about one-quarter nat. size. E. F. Jaws of same, outer and inner views, same reduction. G. Dentary bone of *Diplognathus mirabilis*, inner view, from the Upper Devonian of Ohio, U.S.A., about one-quarter nat. size. *a.* articulation for body-shield; *br.* roof of branchial chamber; *d.* dentary; *ect.* lateralethmoid; *ex.* exoccipital; *mx.* maxilla; *orb.* position of orbit; *p.* pineal plate; *pmx.* premaxilla; *so.* suborbital cheek-plate; *x.* downward process from wall of cranium.

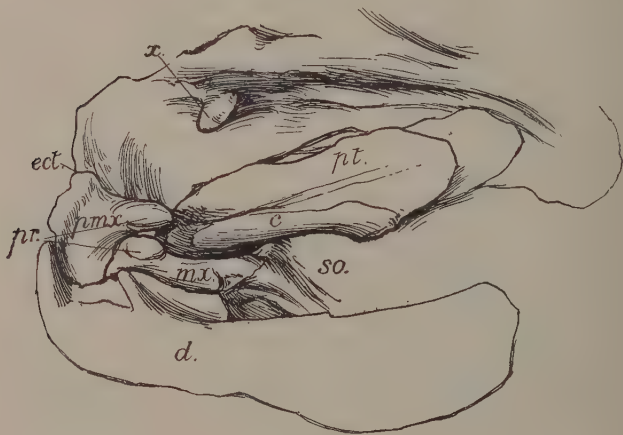
Fine large specimens of *Dinichthys* (figs. 4 C, 4 D) and its allies, however, are well preserved in the Upper Devonian flagstones of Ohio, U.S.A., and these are merely flattened by crushing. I have already pointed out that in *Homosteus* the bony cranial shield extends backwards beyond the brain *, and there can be no doubt that in all Arthrodira it covers the branchial chambers (fig. 4 D, *br.*) behind the occiput. The so-called median and lateral occipital elements, therefore, are not strictly cranial bones, but really posterior to the cranial roof. The posterior end of the brain-case is marked by a pair of ossified cartilages (*ex.*) which seem to correspond with those named exoccipitals in the existing Dipnoi. The upper part of the lateral walls of the brain-case is also ossified, firmly united with the cranial roof, and extends backwards at each posterior angle to form part of the anterior wall of the branchial chamber. The wide antorbital portion of this ossification (*ect.*), transversely grooved to lodge the small anterior jaw-bone, may be regarded as the lateral ethmoid (or ectethmoid). Immediately behind the orbits the ossification gives rise to a pair of stout descending processes (*x.*), which are of undetermined nature. There is no trace of any ossification in the floor of the cranium, and no parasphenoid or other sheathing bone has hitherto been observed. The nasal and otic capsules also have not been seen, and there is no perforation in the cranial roof for an aqueductus vestibuli.

The bones of the cheek and jaw are well shown in their natural relative positions in a specimen of *Dinichthys* in the British Museum (no. P.9340). The suspensorium, however, is as usual not completely ossified, and there is only one isolated bone in each ramus of the mandible (fig. 5, *d.*). The single cheek-plate (*so.*) is articulated with the cranial shield by a very slight overlap, and covers the whole of the postorbital region of the cheek; it also extends beneath the orbit as a narrow bar, from which an almost semicircular flange extends downwards in contact with the outer face of the supposed maxilla (fig. 4 E). The cheek-plate is marked by a groove for the circumorbital sensory canal, from which a branch extends backwards close to and nearly parallel with the lower border. The bone which occupies the position of a maxilla (*mx.*), and may perhaps be so identified, is a very stout blade, longer than deep, with a sharp cutting edge at the oral border. It is firmly adpressed to the flange of the cheek-plate already mentioned, and at its upper border near the anterior end it bears a small but stout inwardly directed process (fig. 5, *pr.*). An anterior bone (*pmx.*) which seems to occupy the position of a premaxilla (and in some species is tuberculated on the outer face), is produced backwards at its upper end in a process which overlaps the process of the supposed maxilla, and is interposed between this and the lateral ethmoid of the skull, into a groove of which (fig. 5, *ect.*) the whole upper edge of the bone fits. This supposed premaxilla slightly overlaps the inner face of the anterior end of

* A. S. Woodward, Proc. Zool. Soc. 1891, pp. 198-201.

the supposed maxilla, and its oral border is produced to a point which works against the outer face of the beak of the opposing bone of the mandible (fig. 4 E). The mandibular bone is evidently only one element of an otherwise persistently cartilaginous jaw*. Its hinder half must have been sheathed at least on the outer face, but its anterior half would be exposed on the outer face of the jaw. Its oral border, opposed to the supposed maxilla, is a sharp, straight cutting edge, of which the outer surface would work against the inner surface of the upper bone. This cutting edge terminates forwards at a notch separating it from a beak-like

Fig. 5.



Crushed edge of head-shield and jaws of right side, inner view, of *Dinichthys intermedius*, from the Upper Devonian of Ohio, U.S.A. *c.* crushing edge of pterygoid arcade; *d.* dentary; *ect.* articulation for premaxilla on lateral ethmoid; *mx.* maxilla; *pmx.* premaxilla; *pr.* articular processes of maxilla and premaxilla; *pt.* pterygoid arcade; *so.* suborbital cheek-plate; *x.* downward process from wall of cranium. (Brit. Mus. no. P. 9340.)

anterior end, of which the postero-external face would work against the antero-internal face of the opposing upper bone. There is no facette for a symphyseal union of the mandibular bone with its fellow of the opposite side; and there seems to be no doubt that a cartilaginous symphyseal region was interposed between the two, because the opposing supposed premaxillæ, which fix their position, are well separated in the middle line by the rostral plate covering the mesethmoid. It has been suggested that

* In an allied genus, *Dinomylostoma*, the cartilage of the mandible is sufficiently calcified to be preserved (C. R. Eastman, Bull. Mus. Comp. Zool. Harvard, vol. 1, 1906, pp. 25, 26, pls. iv., v.).

there may have been unusual mobility of the jaws here; but the specimen now described shows that this was not the case. The cut surfaces of the jaw-bones are marked with a regular series of vertical striæ, proving that the motion was directly up and down.

As shown by the same specimen in the British Museum, and to some extent by a second specimen (no. P. 9490), there lies within the upper jaw already described another arcade (fig. 5, *pt.*), which is evidently pterygoid though its relationships are not quite clear. It is a comparatively slender lamina of bone, which expands at its lower border into a broad hardened punctate surface (*c.*), more or less concave. No bone has been observed which could be opposed to this apparently crushing apparatus.

Jaw-bones which may be regarded as belonging to young individuals of *Dinichthys*, such as a mandibular bone described as *Coccosteus cuyahogæ* by Clappole*, bear conical denticulations along the oral border, and it is only after considerable abrasion by use that the border becomes a simple cutting edge. The toothed condition may therefore be regarded as primitive, and some genera, such as *Coccosteus* (fig. 4 B) and *Diplognathus* (fig. 4 G)†, retain it throughout life. In these the teeth are firmly fused in a single row to the oral margin of the bone, and it is interesting to note that they also occur along the anterior edge of the mandibular element. The latter fact seems to confirm the conclusion that the pair of mandibular bones did not meet at the symphysis, but were well separated by parts which have perished in the fossils. It should be added that in some genera, such as *Mylostoma*, the edges of the jaws are not modified for cutting, but bear crushing plates which are said to consist of dentine‡.

The new observations now recorded show that the Arthrodira are not so closely related to the ancestors of the Amphibia as I formerly imagined. It is, indeed, clear that they are not Dipnoi, and it is difficult to recognize much connection between them and the Crossopterygii. They are not Ostracoderms (as sometimes supposed), for they possess ordinary jaws and parts of paired fins, and their anterior median dorsal armour-plate is differently related to the underlying soft parts§. The usual reduction of the tooth-bearing edges of the jaws to cutting blades without teeth, and the strong development of the dermal armour, indeed, indicate that the Arthrodira are highly specialized members of the group to which they belong, and we cannot determine their precise relationships until we find and recognize their more normal ancestors.

Students of fossils are thus continually baffled by the imperfection of the geological record with which they have to deal. We have learned approximately how fishes passed into amphibians

* E. W. Clappole, *American Geologist*, vol. xi. (1893), p. 167.

† J. S. Newberry, *Palæoz. Fishes N. America* (Mon. U.S. Geol. Surv. no. xvi. 1889), p. 159, pls. xi., xii.

‡ B. Dean, *Mem. New York Acad. Sci.* vol. ii. (1901), pp. 101-109, pls. vii., viii.; C. R. Eastman, *Bull. Mus. Comp. Zool. Harvard*, vol. lii. (1909), pp. 261-269.

§ A. S. Woodward, *Proc. Linn. Soc.* 132nd Sess. (1920), p. 34.

not later than the Devonian period, but we still lack a multitude of links for which we must wait patiently until mere accident reveals them. We vaguely see that the earliest Dipnoi were more closely related to the earliest Crossopterygii than are the later Dipnoi to the later Crossopterygii. They were therefore nearer a common ancestor. To find this common ancestor, to recover more links, and to explain the problematical Arthrodira, we need fossils of still earlier date than those we already possess.

Lt.-Col. J. T. TULL WALSH then moved :—"That the President be thanked for his excellent Address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which resolution, having been seconded by Sir NICOLAS YERMOLOFF, was put and carried with acclamation.

The President having acknowledged the Vote of Thanks, proceeded to address Prof. EDWARD BAGNALL POULTON, F.R.S., and handing to him the Linnean Gold Medal. He said :—

Professor POULTON,—

The Council of the Linnean Society has awarded to you the Linnean Medal as a token of its appreciation of your long and important services to the advancement of Zoological science. You began by traversing a very wide field, from bone-caves and Pleistocene geology to the structure of the tongues of Marsupials, and you accomplished much histological work which culminated in your interesting discovery of true teeth in the embryo *Ornithorhynchus*. Your inclination, however, was always towards entomology, and you have for many years been regarded as the chief exponent of the phenomena of protective resemblance and mimicry in insects. With persistent industry you have brought together an immense array of facts from all parts of the globe in support of the view that these appearances are adaptive in their nature, and furnish strong evidence of the potency of natural selection. You have stimulated naturalists and collectors everywhere to observe and record such facts, and to send home illustrative specimens which you have added to the Hope Collection at Oxford. During your tenure of the Keepership of this collection, indeed, you have entirely changed its character. From being a vast series of specimens interesting mainly to systematists of the old school, you have made it into a great museum illustrating variation, geographical distribution, mimicry, and other phenomena important for the theory of evolution. With the co-operation of Mr. Arthur Sidgwick you have devised an accurate and comprehensive nomenclature to include all cases of protective and aggressive resemblance, thus clearly marking the difference between the mimicry discovered by Bates, and the cases which fall under the head of "synaposematic association" as explained by Müller. You have also done most valuable experimental work on "variable protective resemblance," especially demonstrating

the dependence of the coloration of certain larvæ and pupæ on the character of their surroundings, and disproving the suggestion that the observed effects are due to any direct influence that might be called "photographic." Your experiments have enabled you in many cases to determine within narrow limits the period during which the nervous system becomes or remains sensitive to the effective stimulus, and during which the ultimate colour-result becomes fixed. They have also demonstrated the direct transference of the green pigment of plants to the tissues of the caterpillars feeding on them.

These and other researches have led you to be a consistent upholder of the Darwinian position with regard to natural selection as the dominant factor in evolution. In your complete rejection of Lamarckism and such speculations as Darwin's pangenesis, you may even be described as more Darwinian than Darwin himself.

While occupied with your own researches and advancing science by your writings, you have always been a most generous and appreciative helper of other workers in your subject. You have been especially successful in stimulating young collectors of insects to extend their interest to the broader problems of bio-nomics and make real scientific progress. In wider spheres you have also taken a most active part in work for the promotion of biological science, and the Linnean Society remembers with gratitude your services both on the Council and as President. I am sure the whole Society shares in the pleasure and satisfaction with which the Council gives you this mark of its esteem.

The recipient feelingly acknowledged his gratification at the award.

The General Secretary then placed upon the table the obituaries of deceased Fellows and Foreign Members, and the proceedings terminated.

OBITUARY NOTICES.

ODOARDO BECCARI (1843-1920).—Odoardo Beccari, the third child of Giuseppe di Luigi Beccari and the first of his mother Antonietta, was born in Florence, 16th November, 1843. Losing his mother at six years of age, he was confided to the care of a maternal uncle. In due course he entered the college now known as the Nazionale di Luca in the spring of 1853, where he found the Abate Ignazio Mezzetti as Vice-Rector and Prefect of Studies, a devoted student of natural science, especially botany, and, noting the observant spirit in the boy, he specially taught him the beginnings of the science, and imbued him with a lasting love of plants; the pupil never forgot his first instructor, and long afterwards he dedicated a genus of Anonaceæ to his memory as *Mezzettia*.

In 1861 Beccari, having completed his course at Lucca, entered the faculty of Natural Science at the University at Pisa. His work in botany attracted the attention of the celebrated Giuseppe Meneghini and Pietro Savi; but the atmosphere was not sufficiently tonic, and he passed to Bologna in 1864, where A. Bertoloni was Professor; here he presented his thesis, "Illustrazione dell' *Arnoldia cyathodes*, Massal."

Soon after this he met with Giacomo Doria, just returned from a scientific journey in Mesopotamia, and the two young men became intimate. By the advice of one of our Fellows, John Ball, they determined to undertake the exploration of the then little-known Northern Borneo, especially Sarawak. Whilst his companion was making the needful preparations, Beccari came to London, and visited the British Museum and Kew to get an acquaintance with the Bornean and Indian floras. This was in 1865, when he made the acquaintance of the two Hookers; in 1908, when he visited Sir Joseph Hooker for the last time, the veteran said: "I knew he would become a famous botanist, but he has surpassed my expectations; he is the greatest biologist and systematist of the present moment; he has the intuition of what a species is."

To return to his first visit, Beccari was introduced to Darwin, and by Miss Burdett-Coutts presented to Sir James Brooke, Raja of Sarawak, who promised him help in his territory.

He sailed from Southampton to Borneo on the 4th April, 1865, meeting a brother and Doria, as arranged, at Suez; passing Aden they landed in Ceylon and visited Thwaites at Peradeniya, reaching Kuching, the capital of Sarawak, in June.

G. B. Beccari left for Japan in three months' time, and the two remained to prosecute their respective ends; by the beginning of March, Doria's health gave way, and Beccari accompanied his friend to Singapore to return home. For three years, 1865-68, Beccari remained in Borneo; his volume '*Nelle foreste di Borneo*,' issued in 1902, gives a vivid picture of his life during this period. He returned to Italy in March 1868, and began in Florence to work out his collection, there founding the '*Nuovo Giornale Botanico Italiano*,' which he directed during 1869-71; nevertheless he took advantage of a special expedition to Ethiopia in 1870 to go thither and return with a rich cargo of plants; he wrote an account of this journey, but for some unexplained reason it was not published.

Meanwhile he had been preparing himself for another expedition, attracted by the charm of the forest, and possessed of the methods for the best employment of the scheme, he further studied geodesy, astronomy, and meteorology. All being ready, at the end of 1871, with Luigi Maria d'Albertis, he started from Genoa for New Guinea, at that time quite unexplored; pausing a fortnight at Bombay, he continued to Singapore, finally reaching Batavia. After a short stay here, to acquire further information concerning Malaya, the traveller journeyed to Macassar in Celebes, Amboina, where a small schooner was chartered, and after many

difficulties Kapaor was reached. But this place was unhealthy, fevers raged, and quitting the spot on a wretched craft, they reached Dorei, and achieved the exploration of Mount Arfak as the crown of their endeavours. Besides geological specimens, many birds, mammals, beetles, and reptiles, he had 700 numbers in ample supply, together with spirit specimens.

The health of D'Albertis had now become so bad that it was impossible for him to stay in the tropics, so the two travellers, after great difficulty, came upon the Italian corvette, 'Vettor Pisani,' and upon this vessel D'Albertis embarked. In 1873, Beccari visited the islands of Aru and Kai, virgin soil for the botanist. Here under native huts thatched with leaves he set up his headquarters; his worst enemies were five species of ant, which threatened to destroy his specimens.

Beccari then returned to Macassar, and after resting and recruiting his health, again set out for the Molucca Islands; at another time, on board the Dutch ship 'Sumatra,' for a trip in 1874.

Before returning home, he much wished to try his luck again in New Guinea, but, as he wrote home, his finances were exhausted. From this difficulty his friend Giacomo Doria relieved him by inciting the citizens of Genoa to send the sum of 15,000 lire as a help.

Relieved and encouraged by this, Beccari journeyed by Batavia to Ternate, and Andai, to climb Mount Arfak. After a successful quest, he embarked in March 1876 for Java, in due course reaching Florence, where he was received with great enthusiasm. In the autumn of the following year he again started for Malaya, this time with Enrico D'Albertis, a cousin of his former companion, landing at Bombay and traversing India to Calcutta, thence to Singapore, onwards to Sydney, Melbourne, and Hobart; New Zealand; followed by a return to Singapore, and then to Sumatra, where he found the *Amorphophallus Titanum* and also the tiny Aroid *Microcasia pygmæa*.

In 1878 he left Batavia for his last journey: Padang, where he investigated the products; Singalang, where he stayed some time diligently collecting, till finally he directed his course homeward, and Florence was reached in the last days of 1878, closing his career as an explorer but beginning another as illustrator.

'Malesia' grew under his pen during 1877 to 1886, 3 volumes in quarto. Greatly to his mortification, when the third volume was half printed, the Istituto di Studi Superiori, which had financed the publication so far, ceased to provide the funds, but this becoming known in England, a contribution from the Bentham Fund enabled Beccari to complete his splendid work.

The magnificent folio 'Asiatic Palms' practically closed the authorship of Beccari: the second part appeared posthumously in 1921 as 231 pages and 6 plates in quarto, and 120 plates in collotype in folio; but the full extent of the work can only be assessed by reference to the ten pages of Bibliography,

drawn up by his pupil, Prof. U. Martinelli, in *Webbia*, v. (1921), 61 pp., with 2 maps, from whose vivid narrative the foregoing pages have been condensed.

An operation was performed on the 25th October, 1920, when Beccari had reached his 77th year; death ensued in his sleep without shock or pain. He was buried in the cemetery of the 'Misericordia' at Soffiana, near Florence.

Beccari was elected a Foreign Member of the Linnean Society, 3rd May, 1883. [B. D. J.]

WILLIAM BEECROFT BOTTOMLEY, the only son of J. Bottomley, of Fern Cliffe, Morecambe, was born at Apperley Bridge, Leeds, in 1863; educated at the Royal Grammar School, Lancaster, and King's College, Cambridge, whence he graduated in 1891, proceeding M.A. in 1900. At the age of 23 he was science tutor and lecturer in Biology at St. Mary's Hospital School, retaining that position till 1891, when he succeeded to the professorial chair of Biology at the Royal Veterinary College; two years later, on the retirement of Prof. Richard Bentley from the chair of Botany at King's College, Strand, Bottomley succeeded, an office he held from 1893 to 1921, when ill-health obliged him to retire.

Prof. Bottomley was much interested in such movements as the South Eastern Co-operative Agricultural Society, but he was perhaps best known by his experimental research on "bacterised peat" as a plant-stimulant and fertilizer, thereby securing nitrogen-fixing organisms for the benefit of the crops. One result was that as animals are in need of vitamins or accessory factors for their nutrition, so plants need the help of similar factors, which he termed "auximones," to thrive. Considerable success followed his efforts, and it is said that during the war, attempts were made to obtain cultures for an enemy nation, but without success.

He was elected Fellow of our Society, 3rd November, 1892; besides his Cambridge degree, he was Ph.D., and a Fellow of the Chemical Society since 1886. He died at Huddersfield on the 24th March, 1922. [B. D. J.]

GEORGE SIMONDS BOULGER, who died suddenly at his house in Richmond on the 4th May, 1922, was the son of Dr. Edward Boulger, and was born on the 5th March, 1853, at Bletchingley, Surrey, and was educated at Wellington and Epsom Colleges, and for a short time at the Middle Temple; at the age of 23, in 1876, he was appointed Professor of Natural History at the Royal Agricultural College, Cirencester, where he became Honorary Professor in 1906; since 1884 he was Lecturer on Botany and Geology at the City of London College, and at the Imperial Institute since 1917. Much of his time was spent in coaching students and officers for examinations, and although the books noted below show great perseverance, he once admitted to the present writer, that he only wrote slowly: anyhow, his work was solid and good. From 1884 to 1890 he edited the 'Proceedings' of the Geologists'

Association, and for thirteen years also 'Nature Notes,' now known as the 'Selborne Magazine'; he was further a Vice-President of the Selborne Society.

Of the volumes from his pen may be mentioned 'Familiar Trees,' 2 series, 1885-86; 'The Uses of Plants,' 1889; 'Elementary Geology,' 1906; 'Wood,' 1902; 'Botany' [1912]; 'Plant Geography,' 1913; and associated with other writers we have:—with Mr. James Britten, 'A Biographical Index of British and Irish Botanists,' 1893, with supplements in 1899, 1905, and 1908 (a revised edition is only awaiting better times for printing to be brought out); with Mrs. Henry Perrin as artist, 'British Flowering Plants,' 4 vols., 4to, 1914; with Mrs. Jean A. Owen Visger, writing as J. A. Owen, 'The Country Month by Month,' 1904-5, fifth edition 1914; he also re-edited the Rev. C. A. Johns's 'Flowers of the Field,' 33rd edition, "entirely revised," 1911, and the same author's 'The Forest Trees of Britain,' 10th edition, "revised," 1912. In addition were many shorter papers published in the volumes of societies with which the author was connected.

He was elected Fellow of the Linnean Society on the 1st February, 1877; he was also a Fellow of the Geological Society from 1875. [B. D. J.]

OTTO BÜTSCHLI was born in Frankfurt, the son of a Swiss who had settled in that town, and married a lady who had lived all her life there, Emilie Kullmann. Our late Foreign Member was born on the 3rd May, 1848. After early school-days he turned his attention to mineralogic chemistry and palæontology, and at 17 years of age became assistant to Zittel; then spent twelve months at Heidelberg and graduated with mineralogy as his principal subject. It was now that interest for living nature awoke in him, and then it took possession of him. Except during one semester under Leuckart in Leipzig, he was self-taught. In 1869 to 1876 he lived with slight breaks in Frankfurt, served in the Franco-German War of 1870 as Landwehr officer, and then became for two years assistant to Möbius in Kiel. By this time he had published many papers on Protozoa, the development and morphology of invertebrates. In 1878, whilst still under 30 years of age, he became Professor of Zoology and Palæontology in Heidelberg, where he remained to the end, in spite of many flattering invitations elsewhere. Bütschli had the teaching talent, though towards the last he began to feel his duties somewhat of a burden; but the desired freedom to devote himself entirely to his 'Comparative Anatomy' was not attained till the close of the great war, during which period he had lost strength, and unable to withstand a severe illness which came on.

Studies on the cell-division and conjugation of the Infusoria was Bütschli's first important work, which appeared in 1876 in the Senckenberg Abhandlungen. This, together with Strasburger's work on the doctrine of the cell, established these observations on

firm ground; the phenomena of indirect cell-division was shown and explained, and karyokinesis set forth as occurring both in plants and infusoria.

Bütschli prosecuted his researches during the following years with the greatest energy, until in 1880 he undertook a thorough working out in Bronn's 'Klassen und Ordnungen des Tierreichs.' Nine strenuous years were given to these bulky three volumes, the subject being critically handled. The considerable progress of protozoa research during the last thirty years is inconceivable without Bütschli's labours.

From this he turned to Bacteria and Cyanophyceæ and the question of the constitution of Protoplasm connected with the phenomena of life. In his 'Untersuchungen über mikroskopische Schäume und das Protoplasma,' 1892, he set up his foam theory, with its associated ideas. He continued his investigation during succeeding years, and also in chemistry and crystallography, whilst still labouring as Professor of Zoology. He did not live to complete his 'Comparative Anatomy' though the bulk was written. He died on the 2nd February, 1920; his Foreign Membership of the Linnean Society dated from 7th May, 1908.

The writer is indebted to the notice of Bütschli, with a portrait, printed in the 51st Bericht der Senckenbergischen Naturforschenden Gesellschaft, in 1920. [B. D. J.]

FRANCIS MAULE CAMPBELL (1843-1920).—From additional information received since the notice of our late Fellow was printed in the 'Proceedings,' 1920-21, p. 45, the following amended statement is issued:—

In 1902, Mr. Campbell married the widow of Mr. Edward Yeeles, of Bath, who died in 1919; his second marriage took place at St. Mary Abbot's, Kensington, on the 20th October, 1920, to Mrs. Dunkerley, widow of the late Prof. Dunkerley, of Manchester University, her maiden name being Jebb.

The illustrious French zoologist, YVES DELAGE, Professor of Zoology at the Sorbonne and Membre des Académies des Sciences et de Médecine, died on October 8th, 1921, at 66 years of age. Coming to Paris as a young medical student, Delage was soon attracted to the study of zoology by his famous predecessor, Lacaze-Duthiers. Most of his researches were carried out at the marine laboratory of Roscoff, of which he later became Director. A most versatile and industrious worker, his researches cover a wide field. Among his early works may be mentioned an important memoir on the vascular system of Crustacea and another on the nervous system of the Planaria acœla. But it is for his work on the life-history of the remarkable parasitic Crustacean *Sacculina* and on the Embryology of Sponges that he is best known. Delage first described the strange inversion of the germ-layers and the origin of the collar cells in the higher sponges. In later years he studied with his usual enthusiasm and originality

problems of experimental parthenogenesis, until the failure of his eyesight compelled him to give up practical observations and devote himself to writing. Already in 1895 he wrote a monumental volume on 'Les Théories de l'hérédité et les grands problèmes de Biologie générale,' and next year in collaboration with Hérourard began to publish the valuable and beautifully illustrated 'Zoologie Concrète.' Next he started the 'Année Biologique,' a very useful summary of current work on general zoology. Smaller books on 'Les Théories de l'Évolution,' 1909, and on 'La Parthénogénèse,' 1913, were published in collaboration with M. Goldsmith. Lastly, shortly before his death, appeared a treatise on Dreams. He was elected a Foreign Member on the 6th May, 1909. [E. S. G.]

HENRY JOHN MORETON, 3rd Earl of Ducie, born 25th June, 1827, was descended from Sir John Ducie, Lord Mayor of London and Banker to Charles I. Educated at Eton, he was one of the last survivors of the last "Montem" in 1844. He succeeded his father in 1853, and for a period of 70 years played the part of a great English landowner and an assiduous patron of science and art.

A geologist and botanist of some eminence, in virtue of which he was elected a Fellow of the Royal Society in 1855. He was Lord Lieutenant of Gloucestershire for 54 years, and at the time of his death he was "Father" of the House of Lords, of the Privy Council, of the Royal Society, of the Geological Society, and of many other Societies and Institutions.

Lord Ducie was a Fellow of the Linnean Society for upwards of 32 years, and although he took no prominent part in its proceedings he devoted his long life to the scientific study of plants, and especially to the study of trees, both coniferous and broad-leaved. He was also an ardent yachtsman and traveller, and at Tortworth in Gloucestershire, from his earliest years onwards, he amassed a large collection of trees from the temperate regions of the world. Of these he kept a painstaking record, and though he could never be induced to publish a catalogue, it may safely be said that the collection is surpassed by very few in the country. A leading authority on arboriculture, he was one of the first to recognise the value of the Douglas Fir (*Pseudotsuga Douglasii*), and one of the earliest and most famous plantations of this great timber tree may be seen at Tortworth. Some of the oldest specimens, too, of the Japanese Larch (*Larix leptolepis*) were planted by him; of the Chilean Beech (*Nothofagus obliqua*), which was introduced to this country by his old friend, Henry Elwes, F.R.S., and of the Oregon Chestnut (*Castanopsis chrysophylla*) he possessed perhaps the largest and oldest specimens in the country, not to mention numerous other trees, Oaks and Hickories in particular, with which he delighted to experiment with a view to economic or ornamental utility.

Lord Ducie shared with the late Monsieur Allard, of Angers, the rare satisfaction of being spared to see his plantations of broad-

leaved trees and conifers grow to maturity in his lifetime, and he used with pride to show to his friends specimens of such a size that it was almost impossible to believe that they had been planted by a living man.

A man of cultivated tastes, genial, liberal, and warm-hearted in disposition, thorough in everything he undertook, he maintained his faculties and interest in affairs to within a short time of his death. He died on October 28th, 1921, in his ninety-fifth year, and was buried in Tortworth Churchyard in close proximity to one of the most celebrated trees in England, an immense Spanish Chestnut, supposed to date from the reign of King John.

His only son having predeceased him without issue, he was succeeded by his brother, who, after an unbroken absence in Queensland of no less than 66 years, has recently returned to this country and taken up his residence at Tortworth.

[G. W. E. LODER.]

JOHN FIRMINGER DUTHIE was the son of the Rev. A. H. Duthie, rector of Sittingbourne and afterwards of Deal; he was born on the 12th May, 1845, and educated at Marlborough College and at Jesus College, Cambridge, where he graduated B.A. in 1867, with a Third Class in the Natural Science Tripos. After a short tutorship in Somerset, he discovered *Polygala austriaca* in Kent, and then travelled in Italy and certain of the islands in the Mediterranean, collecting as he went, but his early gatherings were burned in a repository where they were deposited.

On the 15th April, 1875, he became a Fellow of this Society, and in the same year was appointed Professor of Natural History at the Royal Agricultural College, Cirencester; but the following year he was made Superintendent of the Botanic Garden at Saháranpur, vacant on the retirement of Dr. Jameson, and here he remained for twenty-seven years, retiring in 1903.

He drew up the account of Myrtaceæ in the second volume of the 'Flora of British India' (except five pages by Mr. C. B. Clarke on the tribe of Barringtoniæ), which came out in 1879; next, in 1881, he brought out his 'List of North-West Indian Plants,' and two years afterwards 'A List of the Grasses of North-Western India, indigenous and cultivated,' in the Report of the Department of Agriculture of the N.W. Provinces. Reports on the Government Gardens of 'Saháranpur and Mussoorie' for 1885 and 1886 followed. In 1885 was printed his account of Grasses growing on the Hissar Bir land, Punjab; and then came the folio 'Illustrations of the indigenous Fodder Grasses of the Plains of North-Western India,' Roorkee, 1886; the same year witnessed his account of a botanical tour in Rajputana, with yet another volume, 'The Fodder Grasses of Northern India,' in 1888; in 1896, 'A Botanical Tour in Kashmir.' He was also associated with Mr. (now Sir) Joseph Bampfylde Fuller, 'Field and Garden Crops of the North-Western Provinces and Oude,' in three parts, Roorkee, 1882-93, in quarto.

Besides his official work at Sahárunpur, Duthie lectured on systematic botany every year to the students at Dehra Dún, and usually accompanied them through the forests for demonstration.

On his quitting India in 1903, Duthie was appointed Assistant for India in the Herbarium at Kew, but illness in 1907 forced him to resign. Whilst there he revised, at the request of Sir Richard Strachey, the great collection known as the "Strachey and Winterbottom" plants, of which an unpublished but printed list was extant. A 'Catalogue of Plants found in Kumaon and Garhwal and the adjoining parts of Tibet,' forming pp. 63-122 of volume ii. of a projected work, dating from about 1854, was revised by Duthie, and came out as pp. 403-670 of E. T. Atkinson's 'Economic Products of the N.W. Provinces,' Allahabad, 1876: another and independent issue appeared "Revised and supplemented by J. F. Duthie," London, 1906. The latest work on which he was engaged was his 'Flora of the Upper Gangetic Plain,' of which two volumes and two parts of the third to Juncaceæ have appeared at Calcutta, 1903-15.

In 1879 he married Miss Coape-Smith, daughter of Colonel Coape-Smith, an officer stationed at Sahárunpur. In his literary labours he was careful, and spent much time in determining knotty points, but in consequence was not rapid in his work. He died at Worthing on the 23rd February, 1922. [B. D. J.]

A Fellow of long standing has passed away recently in the person of Dr. JOHN HARLEY, who died at his house, 'Beedings,' Pulborough, Sussex. He was born in Shropshire in 1833, where he studied the geology of the country round Ludlow, specially paying attention to the microscopical structure of the skeleton fragments in the Ludlow bone-bed, publishing a paper on the subject in the *Quarterly Journal of the Geological Society* in 1861.

During his medical studies about that period he turned his attention to vegetable parasites, with a view to gaining an insight into the cause of cancer and similar diseases in the human subject. In March 1863 a paper of his on the Mistletoe was read before the Linnean Society, followed by his election three months later. The author described the parasitic growth and its effect upon its host, and the action of the "sinkers" or suckers, which grow downward into the wood of the host, closing with the results observed on 31 woody trees infested with mistletoe.

He retired from his position as physician at King's College Hospital, London, in 1902, and removed to the house he had built, which he lived in during the remainder of his life. His geological collection was bequeathed to the Ludlow Museum.

[B. D. J.]

There are but few amongst the present generation who can remember seeing the late Sir JOHN KIRK, G.C.M.G., K.C.B., LL.D., M.D., D.C.L., Sc.D., F.R.S., in our rooms, for since the Society has occupied these apartments, he probably on only one occasion

entered the Meeting room, though from 1881-83 he was a Member of the Council. The last occasion on which the present writer met him was during the sittings of a Departmental Treasury Committee in 1900-01, when Sir John Kirk was punctual and constant in his attendance.

He was born at Barry, near Arbroath, on the 19th December, 1832, the second son of the Rev. John Kirk, of Arbilot. Attracted to botany, but choosing medicine as his profession, he entered Edinburgh University before completing his 15th year, and in 1854 he graduated as M.D. and L.R.C.S. The Crimean War broke out at that time, and Kirk organised a party of twenty Scottish medical students to proceed to the seat of war; he was appointed assistant physician at Renkioi, where he found time to collect a few plants and open up correspondence with Sir William Hooker at Kew.

Returning home in 1857 he was meditating seeking an appointment in Canada, when the opening occurred of his going with Livingstone on his Zambesi mission. They left England in March 1858, and soon after starting, Kirk acted as second in command during the five eventful years which followed. Coming back to the lower Zambesi, he employed all his skill in trying to save the life of Mrs. Livingstone, and then falling ill himself, he was ordered home, which he reached in 1863.

He accepted in January 1866 the post of surgeon to the political agency at Zanzibar; the next year he became Vice-Consul, a twelve-month later Assistant Political Agent, and in April 1873, Agent and Consul.

He married Helen Cooke in 1867 at Zanzibar, and three of his four children were born there. He energetically supported Sir Bartle Frere in his efforts to suppress the slave trade, which succeeded in 1873, after Frere had left. Kirk was raised to Consul-General and had honours bestowed upon him—C.M.G. in 1879, K.C.M.G. in 1881, and G.C.M.G. in 1886.

Lord Beaconsfield declined the offer to lease the mainland territories of the Sultan of Zanzibar, so the way was left open for other nations. In 1884, Gerhard Rohlfs was sent to Zanzibar as Consul-General in a ship of war, whilst Carl Peters and two companions in disguise stole across to the mainland treaty-making. But they were forestalled by Mr. H. H. Johnston under Kirk's direction. He left Zanzibar in 1886, and he lived to see the mistakes of 1884-86 rectified and German East Africa come under British administration. Pensioned in 1887, he was still used by the Foreign Office on several missions, and his last trip to Africa was to visit the Uganda Railway.

He settled at Sevenoaks soon after he returned, but still was actively employed, and it was not till 1911, when he was nearly 80, that he quitted his last office, Foreign Secretary of the Royal Geographical Society. Increasing dimness of sight at last prevented his reading, and he passed quietly away on the 15th January, 1922, in his 90th year.

About eight short communications from Sir John Kirk are in our Journal, mostly contributed from Kew where his plants had been examined, and one exhibition of rubber from *Landolphia* was shown in our rooms on the 15th June, 1882; but his chief botanical work was done in conjunction with Kew; he seems to have sent specimens from 1857 to 1896, ranging from Tropical Africa, Seychelles, Comoro Islands, and Somaliland. A full account is given in the 'Kew Bulletin' of this side of Kirk's activity (1922, no. 2, pp. 49-63). He was elected a Fellow of the Linnean Society on the 5th May, 1864, and at the time of his death was only exceeded by four seniors; he was elected F.R.S. in 1887.

* *Papers by Sir JOHN KIRK, in the Society's publications.*

Journal, Botany:—

1. Dimorphism in the flowers of *Monochoria vaginalis*, viii. (1864) 147-148.
2. On *Musa Livingstoniana*, a new Banana from Tropical Africa, ix. (1865) 128.
3. On a new Dye-wood of the genus *Cudranea*, from Tropical Africa, *ib.* (1866) 229-230.
4. On the Palms of East Tropical Africa, *ib.* 230-235.
5. On the Copal of Zanzibar. Extract from a letter from John Kirk, M.D., F.L.S., dated Zanzibar, March 20th, 1868, xi. (1869) 1-4.
6. On Copal. Extract from a letter to Dr. Hooker, dated Zanzibar, November 13th, 1869, *ib.* (1871) 479-481.
7. Identification of the Modern Copal Tree, *Trachylobium Hornemanianum*, with that which yielded the Copal or Animi now found in the earth on the East Coast of Africa, often where no Copal-yielding trees now exist, xv. (1876) 234-235.
8. Note on specimens of *Hibiscus* allied to *H. Rosa-sinensis*, L., collected in E. Tropical Africa, *ib.* (1876) 478-479.—Remarks by Prof. Oliver, *ib.* 479-480.

Proceedings, 1880-82 [15th June, 1882], p. 35:—

9. Exhibition of specimens of the fruit, leaves, and rubber of *Landolphia florida*, from the Island of Pemba, north of Zanzibar; also balls and rubber beaters made and used by the natives of East Central Africa.

Transactions:—

10. On a new genus of Liliaceæ from East Tropical Africa (*Walleria*), xxiv. (1864) 497-499, t. 52.

[B. D. J.]

GEORG ALBERT KLEBS was born on the 23rd October, 1857, at Neidenburg in East Prussia, the third child of his father. He went to school first at Wehlau, where his parents were then living, leaving school there in August 1874, and proceeding to the Albertina, in Königsberg, to matriculate for the study of chemistry; but shortly after he found himself drawn to Natural History, in which he earnestly worked, and after several small contributions he drew up an account of the Desmids of East Prussia, which

attracted the notice of De Bary, who offered him an assistant's place in the Strasburg Institute, and in accepting it, he entered upon a new career. In January 1897 he put forward a new thesis on the East Prussian Desmids for his doctorate.

At this time De Bary had a crowd of disciples round him, such as Errera, Arthur Meyer, Stahl, Maitirollo, Pirodda, and with these Klebs came into the friendliest relations. A year of military duty closed the Strasburg life for him.

Desirous of learning in other fields of research, Klebs turned to Würzburg on being released from military duties, where Sachs was lecturing; here a year was spent, after which he migrated to Pfeffer's laboratory.

Klebs was just 25 when in October 1882 he betook himself to Tübingen. Here he set to work on 'Microorganismen' and 'Bau und Physiologie der Pflanzenzellen.' Special interest was repeatedly displayed by him in the structure of *Hydrodictyon*, and manuscript left by him shows that even late in life he resumed investigation on it. Another topic he took up was the germination of seeds.

In 1887, after Pfeffer had been called to Leipzig and Vöchting came from Basel to succeed him, Klebs went to Basel, where he was very successful, and there married a young wife, Luise Sigarart. His labours on the mechanism of the development of the lower organisms, and the systematic disposition of Algae bore abundant returns.

In 1892-93 he was Rector of the University of Basel, and his address was on the relation of sex in Nature.

During the last decade of the nineteenth century, Klebs was enabled to erect a new botanic institute in Basel, but had hardly opened it, when he was called to Halle in succession to Krauss. Here also he had to busy himself with new buildings—a new laboratory and class-room and glasshouses were speedily completed. *Sempervivum* and *Sedum* were studied for variation, which led on to Klebs's first memoir on physiological chemistry.

In 1907, in consequence of the death of Pfeffer, he received a call to Heidelberg, which he gladly accepted, and there spent a series of successful years. Whilst here he was able, in 1910-11, to travel through Siberia, Japan, Java, and India, and with several companions to visit Armenia, the Caucasus, and Southern Russia in 1912; also, in 1913, a trip to Egypt with his wife.

Latterly he devoted his attention to the question of the amount of mineral matters taken out of plants, occasioned by rhythmic movement, light, and other circumstances. His nature was that of an investigator, and travelling gave the chance for so much that was new that he eagerly seized this, but the great war laid a heavy burden on him, and he turned to his researches.

On the 15th October, 1918, Klebs died of influenza after a short attack, and on the 18th he was cremated. He had been chosen to assume the position of Rector a few months later; many Universities had bestowed their honours upon him, our own Society electing him a Foreign Member on the 4th May, 1911.

A bibliography of his publications will be found in the *Berichte der deutschen botanischen Gesellschaft*, xxxvi. (1918), pp. (110)–(116). [B. D. J.]

The well-known Director of the Paris Muséum d'Histoire Naturelle, Professor JEAN OCTAVE EDMOND PERRIER, Membre de l'Académie des Sciences et de l'Académie de Médecine, was born at Tulle in 1844. His death on July 31st, 1921, deprived the French zoological world of a man of great administrative ability and social distinction, who took an active part in the promotion and organisation of scientific work. For many years he directed a marine laboratory in the little island of Tatihou, near Cherbourg. His own researches dealt chiefly with the Invertebrata. In 1874 appeared his remarkable memoir on the structure of Earthworms, and later many works on the anatomy and classification of Echinoderms. Among his many publications, always distinguished for lucidity and elegance of style, may be mentioned the volumes on 'Les Colonies Animales,' 'La philosophie zoologique avant Darwin,' 1884, 'Lamarck et le transformisme,' 1893, 'La terre avant l'Histoire,' 1920.

'La Tachygénèse ou accélération embryologique,' written in collaboration with Ch. Gravier, is an important contribution to comparative embryology. Since 1892, Perrier published at intervals several volumes of a comprehensive 'Traité de Zoologie,' of which he left in MS. the final part.

He was elected a Foreign Member of the Linnean Society on the 4th May, 1916. [E. S. G.]

RIDEWOOD, Dr. WALTER GEORGE; see p. 70.

A hard-working, enthusiastic naturalist is lost to the Society by the death of the Rev. EDWARD ADRIAN WOODRUFFE-PEACOCK, which took place at Grayingham Rectory on the 3rd February, 1922.

He was the eldest son of the well-known antiquary, Edward Peacock, F.S.A., of Bottesford Manor, where he was born on the 23rd July, 1858; educated first at Edinburgh, he came up to St. John's College, Cambridge, and then at Bishop Hatfield's Hall, Durham, where in 1880 he took the degree of L.Th. After filling several curacies, he became Vicar of Cadney in 1890, remaining there till 1920, when he received the appointment as Rector of St. Radegunds, Grayingham.

He was always an indefatigable note-taker and recorder, especially as regards his native county. He was one of the founders of the Lincolnshire Naturalists' Union in 1893, and for ten years was its organising Secretary, and President in 1905–6; during its whole existence he was the mainspring of its activities. In 1909 he issued a 'Check-List of Lincolnshire Plants.' Phanerogamic botany was his ardent study, and for years he had been engaged on a flora of his own county on ecologic lines; that MS. has been left to Cambridge. He was elected a Fellow of the Linnean Society on the 5th December, 1895; he is survived by a widow and three sons. [B. D. J.]

June 1st, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

The President announced that he had appointed the following to be Vice-Presidents for the ensuing year:—Mr. E. T. BROWNE, Dame HELEN GWYNNE-VAUGHAN, Mr. HORACE W. MONCKTON, and Lord ROTHSCHILD.

Certificates were read for the second time in favour of Major Charles Hunter, M.Sc. (Durh.), and William Nowell, D.I.C.

William Frederick Neville Greenwood, F.E.S., was proposed as a Fellow.

The following were severally elected by ballot as Fellows:—Surendra Nath Bal, Ph.C.; George Valentine Chapman Last, M.R.C.S., L.R.C.P., Ph.C.; Percy Hutchinson Lamb; Cecil Victor Boley Marquand, M.A. (Cantab.); and Charles Turner, F.C.S.

Prof. A. C. SEWARD, F.R.S., then delivered the third Hooker Lecture, entitled "A Study in Contrasts: The Past and Present Distribution of certain Ferns," illustrated by lantern-slides.

The President added some remarks to those of the lecturer, to whom a hearty vote of thanks was given.

June 15th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 1st June, 1922, were read and confirmed.

The report of the Donations received since the last Meeting was laid before the Fellows, and the thanks of the Society to the several Donors were ordered.

Mr. Charles Turner, F.C.S., was admitted a Fellow.

The certificate in favour of William Frederick Neville Greenwood, F.E.S., was read for the second time.

William Henry Wilkins was proposed as a Fellow.

The President announced that Prof. H. O. JUEL, of Uppsala was present as a visitor.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., showed two seedlings of Horse Chestnut from which the terminal bud had been removed by cutting through the epicotyledonary stem. In each case a number of minute buds appeared on the cut surface after the healing of the wound; the buds were arranged round the edge of the section corresponding with the position of the cambium-layer in the stem. A new shoot was also produced in the axil of each of the cotyledons. These new shoots resembled the shoot which is normally developed from the plumule, except that the first pair of foliage leaves was produced at the second node, while a pair of small scales was formed at the first node just above the level of the soil. The speaker referred to the seedling shown by him at a recent meeting of the Society in which the plumule had been replaced by one new symmetrically developed terminal bud.

Dr. A. W. Hill, F.R.S., commented upon the exhibition and compared it with his experience with the corm of *Cyclamen*.

The second paper was by Sir ARTHUR SHIPLEY, G.B.E., F.R.S., on "*Furia infernalis*," in which the conclusion is reached that Linnæus was probably stung by a virulent insect which may very well have conveyed to his system some pathogenic germs unknown at the time of the great naturalist. (See Abstract, p. 63.)

Mr. E. ASHBY exhibited a large series of Australian Chitons, and said that the leaf-sheaths of *Posidonia* and *Cymodocea* were the habitat of certain rare species.

Lt.-Col. J. H. Tull Walsh, Dr. G. P. Bidder, and Prof. E. S. Goodrich, F.R.S., Sec.L.S., contributed additional remarks.

Mr. T. A. SPRAGUE exhibited plants and illustrations concerning his identification of *Sison Ammi*, Linn., of which the type-specimen was on view. He stated that *Sison Ammi* is an Umbelliferous plant published by Linnæus in the first edition of the 'Species Plantarum' in 1753. It has hitherto been a puzzle to botanists. The elder Jacquin in 1773 identified it with a species now known as *Apium leptophyllum*; and Caruel in 1889 identified it with *Ptychotis ammoides*. But examination of the type-specimens in the Linnean Herbarium and the British Museum shows that it is *Carum copticum*, a well-known medicinal plant which yields the Ajowan seeds and Ajowan oil of commerce, from which thymol is obtained. Linnæus gave it the trivial name *Ammi* because he believed it to be the source of the "seeds of the true Ammi" of pharmacy: "*Ammios veri semina*."

The history of the drug Ammi goes back nearly 2000 years. Dioscorides, who lived in the first century of the Christian era, described it as having a minute seed with the flavour of marjoram. The illustration in the 'Codex Vindobonensis,' which dates from the sixth century, represents *Ammi Visnaya*. The Ammi

depicted by Fuchsius in the sixteenth century was *Ammi majus*; and the plant figured by Matthioli about the same time was *Ptychotis ammoides*. But when we turn to the beautiful plates of Umbelliferae published by Rivinius at the end of the seventeenth century we find that the official Ammi of that date was *Carum copticum*. This is confirmed by the specimen of Ammi in the herbarium of Ferro (at the British Museum), a Venetian apothecary who died in 1674. The geographical source of the drug also suggests that the true Ammi was *Carum copticum*. The best quality of Ammi was imported from Alexandria, but was actually grown in Arabia, where *Carum copticum* is still cultivated.

One point remains to be cleared up: the native country of *Carum copticum*. It is or has been cultivated in Egypt, Abyssinia, Arabia, Palestine, Mesopotamia, Persia, Afghanistan, Baluchistan, India, and the Malay Archipelago; but is nowhere certainly known in a wild state.

A discussion followed, in which Mr. E. G. Baker and Lt.-Col. Tull Walsh engaged, the latter remarking that in India Ajowan seeds were chewed for their carminative properties.

Next followed two papers by Dr. WALTER E. COLLINGE, "On the Terrestrial Isopod *Eluma celatum* (Miers) = *purpurascens*, Budde-Lund," and "On two Terrestrial Isopods from Madagascar."

Dr. W. T. Calman, F.R.S., remarked that one of the species named was in the British Museum, but described for the first time by the Author.

Mrs. ARBER, D.Sc., communicated a paper by the late Dr. E. A. NEWELL ARBER, entitled "Critical Studies of Coal-Measure Plant-impressions." It dealt with the following subjects:—I. A Revision of the British Upper Carboniferous species of the genus *Lepidostrobus*, Brongn., preserved as incrustations. II. *Lepidodendron lycopodioides*, Sternb., *L. ophiurus*, Brongn., and a new species. III. *Neuropteris obliqua*, Brongn., and *N. callosa*, Lesq.

Mr. C. TURNER showed the zygospores of *Staurostrum Dickiei* under the microscope; he also brought mounted slides for distribution. *Drosera rotundifolia*, Linn., and *Oryzococcus palustris*, Pers., were also laid on the table for the same purpose.

Dr. G. P. Bidder and Lt.-Col. J. H. Tull Walsh raised certain points which were replied to by the exhibitor.

Mr. JOSEPH BURTT-DAVY gave a summary of his paper, "A Revision of the South African species of *Dianthus*." A few words on the Geographical Distribution closed the paper.

Mr. F. N. Williams, Mr. T. A. Sprague, Mr. E. G. Baker, Dr. Stapf, F.R.S., and Dr. A. W. Hill, F.R.S., spoke on the paper.

BENEFACTIONS.

LIST in accordance with Bye-Laws, Chap. XVII. Sect. 1, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.

1903.

- Royal Society: Contribution toward Dr. Elliot Smith's paper, £50.
 Legacy from the late Dr. R. C. A. Prior, £100 free of duty.
 Mrs. Sladen: Posthumous Portrait of the late Walter Percy Sladen, by H. T. Wells, R.A.
 B. Arthur Bensley, Esq.: Contribution to his paper, £44.

1904.

- Royal Society: Grant in aid of third volume of the Chinese Flora, £120.
 Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.
 The same: Bulliard (J. B. F.). *Herbier de la France*; *Dictionnaire*; *Histoire des plantes vénéneuses*; *Champignons*, in 10 vols. Paris, 1750-1812.

1905.

- Royal Society: First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.
 Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

1906.

- Royal Society: Second grant towards 'Biscayan Plankton,' £50.
 Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.
 Royal Swedish Academy of Science: Copies of portraits of C. von Linné, after Per Kræfft the elder, and A. Roslin, both by Jean Haagen.

1907.

- Royal University of Uppsala: Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).
 Royal Society: Third and final grant towards 'Biscayan Plankton,' £50.
 The Trustees of the Percy Sladen Memorial Fund: First grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark,'* £200.

1908.

Prof. Gustaf Retzius: Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby: the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S. Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

1909.

The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean* in H.M.S. 'Sealark,' £200.

Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

1910.

Royal Society: Grant towards Dr. G. H. Fowler's paper on Biscayan Ostracoda, £50.

Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.

Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0s. 6d.

Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's *Researches in the Indian Ocean*, £200. (For third volume.)

1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the *Indian Ocean Researches*, £70.

The same: First Donation towards the fourth volume, £130.

1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on Himalayan *Chermes*, £46 15s. 2d.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the *Indian Ocean Researches*, £140.

The same: First Donation towards the fifth volume, £60.

1913.

- Royal Society: Grant towards Dr. R. R. Gates's paper on Mutating *Oenotheras*, £60.
 Sir Frank Crisp, Bt., Wallichian Cabinets, £50.
 The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

1914.

- Royal Society: Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.
 Miss Foot: Cost of illustration of her paper on *Euschistus*.
 The Trustees of the Percy Sladen Memorial Fund: Third Donation towards the fifth volume, £10.
 The same: First Donation towards the sixth volume, £190.

1915.

- The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the sixth volume, £80.
 Miss Foot: Cost of second paper on *Euschistus*, £32 10s.
 Royal Society: Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.
 The same: towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.
 Miss Marietta Pallis: Instalment of cost of her paper on *Plav*, £30.
 Thomas Henry Riches, Esq.: Dr. A. R. Wallace's library on Natural History.
 Sir Frank Crisp, Bt.: New shelving for Wallace's Volumes.

1916.

- Mr. E. Heron-Allen: Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.
 Messrs. H. Takeda and C. West: Contribution towards the illustration of their paper, £40.
 Royal Society: Contribution towards the illustration of two papers by Prof. Dendy, £40.
 The same: Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.
 The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.
 Miss Marietta Pallis: Balance of cost of her paper on *Plav*, £90 16s. 6d.
 Sir Frank Crisp, Bt.: Phototyped copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

1917.

- British Ornithologists' Union, etc.: Contribution towards cost of Mr. H. N. Ridley's paper, £20.
- The Royal Society: Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.
- Sir Frank Crisp, Bt.: 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.

1919.

- Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.-xl. (1884-1912) and the Botanic entries in the 'Proceedings' for the same period.

1920.

- The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.
- The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

1921.

- The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10s.
- The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.
- The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.
- Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.
- Prof. C. S. Sargent, F.M.L.S.: Eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

1922.

- The late Sir Joseph Hooker: Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)
- Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled "Critical Studies of Coal-Measure Plant-impressions," £60.

ABSTRACTS.

Note on the Occurrence of *Brachiomonas* sp.

By W. NEILSON JONES, M.A., F.L.S.

[Read 1st December, 1921.]

THE sudden appearance of many of the simpler algæ in a locality and their equally sudden disappearance from it is a well-known phenomenon. The present communication deals with a mysterious visitation of this kind, which is worth putting on record on account of the rareness of the species in question and of the unorthodox conditions under which it was found growing.

Brachiomonas is a unicellular green alga belonging to the subfamily *Chlamydomonadeæ* of the family *Volvocineæ*. It is characterised by possessing a cell-body furnished with four regularly disposed hollow lateral horns, each of which is curved backwards, and a fifth posterior horn which is straight. At the apical end are two long cilia arising from a slight wart-like protuberance. The nucleus is situated anteriorly; a large pyrenoid is present towards the posterior end. The chloroplast appears, in most cases at least, to extend not quite to the tips of the horns: this is specially noticeable in the posterior horn. The protoplasm, however, extends to the distal end of each horn. Reproduction takes place (1) by the formation of four zoospores within the body of the mother-cell, which retains its motility up to the moment that the zoospores are liberated—or even a little longer; (2) by the formation of gametes of smaller size than the zoospores, 16 in each mother-cell, which conjugate in pairs to form a resting zygote. The organisms progress forward with a somewhat jerky movement, rotating about their longitudinal axes.

The botany garden at Bedford College possesses, among other possible locations for algæ, a small lily pond about 2 feet deep and a winding "ditch" of varying depth. The latter, owing to defects in the concrete, had been allowed to dry out in the summer of 1920 preparatory to repairs being carried out: in May 1921 it was for the most part dry, although some of the deeper parts still contained water.

During May, material of *Chlamydomonas* was required, and samples of water were collected from the garden and examined in the laboratory. In three cases the water was found to contain an almost pure culture of *Brachiomonas*. In every case these samples had been taken from shallow pools formed in the ditch by recent rain—the lily pond and the deeper pools showed no evident signs of the alga.

The appearance of this plant in London becomes the more interesting when its known distribution is considered. So far as I have ascertained, there are recorded in the literature only three

stations in which *Brachiomonas* has been found: Sheerness in Kent, Stockholm in Sweden, and Constanta on the Black Sea—in all cases in brackish water.

It must be presumed, therefore, that in the present case the alga was transported a distance of at least forty miles, either by wind to be deposited eventually by rain, or possibly by the sea-birds which visit Regent's Park constantly. One must not forget, however, that if the plant occurs at Sheerness, it may extend up the estuary of the Thames, even though unrecorded. Although the distance travelled in the latter case would not have been so great, the mechanism of transport remains an unsolved problem.

During the fortnight or more that the plant was kept under observation, it appeared to be in perfectly healthy condition, in spite of the fresh-water habitat.

The earliest account is that of K. Bohlin (1897), whose material was obtained from brackish water off the Swedish coast, the salt content of the water being about one-third that of the open sea. A second description is given by E. C. Teodoresco of material obtained by him at Constanta on the Black Sea. There the alga was found under similar conditions to those described by Bohlin, viz. in rock pools containing brackish water. A description in considerable detail is given by G. S. West (1907) of material obtained from brackish marshes at Sheerness. The alga was then reported to be common there in February: whether this is still the case I have not ascertained.

Bohlin distinguished two species, *B. submarina* and *B. gracilis*, the former possessing a more spherical and massive body and shorter horns. West referred the Sheerness organism to *B. submarina* after some hesitation, since the specimens showed much variability and were, on the whole, intermediate in form, none having processes so short as figured by Bohlin for *B. submarina*, nor the anterior part of the cell so flattened or the posterior horn so long as figured for *B. gracilis*. The London samples also showed very great variability. If there are two species of *Brachiomonas*, then I think it likely that both were present in the samples examined by me. An alternative view is that one is dealing with a single species which exhibits a great range of form.

To summarise:—*Brachiomonas*, a genus hitherto recorded only from three widely-separated stations in brackish water, is now put on record for London growing in fresh water under conditions which suggest that it may have been deposited with rain or brought by sea-birds. The individual plants showed great variability of form, ranging between the types figured by Bohlin as *B. submarina* and *B. gracilis*.

My thanks are due to Prof. F. E. Fritch for identifying the material as *B. submarina*.

References.

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- TEODORESCO, E. C.—Matériaux pour la flore algologique de la Roumanie. Bot. Centralb. Bd. xxi. Abt. ii. Heft 2.
- WEST, G. S.—Some critical Green Algæ. Journ. Linn. Soc., Bot. xxxviii. (1908), pp. 279–289, tab. 20, 21.

Bedford College,
Regent's Park, London, N.W. 1.
Nov. 1921.

The Life-History of *Staurostrum Dickiei* var. *parallellum* (Nordst.).
By CHARLES TURNER, F.C.S., Manchester. (Communicated
by the General Secretary.)

[Read 6th April, 1922.

(PLATE 1.)

THE summer of 1921 was characterised by the long period of dry weather during June and July; the pastures were withered and the grass beside the railways was burned in large patches. Towards the end of the latter month I went to Glyn Ceiriog, a picturesque district about four miles south of Llangollen. The chief attraction is perhaps the little river Ceiriog, a tributary of the Dee, which flows down the valley and is a stream well known to the disciples of Izaak Walton for the excellence of the trout-fishing and for the Fish Hatcheries near Chirk. When the rainfall is abundant the stream becomes a torrent, but the long drought had caused its diminution, and the current had become negligible in the detached pools which had been left at the side of the stream. The district is in the Silurian formation, and there are quarries of granite and slate as well as deposits of limestone in the vicinity. I was looking out for Algæ, and had a small microscope with me for the preliminary exploration. After a few days of introductory exploration, I settled down to a semi-stagnant pool by the side of the river, not far from a farm known to tourists as the place in which the chair of the celebrated Welsh Bard, Hugh Morris, is still to be seen. One of the slides which I have prepared has on it more than a hundred zygospores of *Staurostrum Dickiei* var. *parallellum* (Nordst.), in addition to those of two other Desmids, and the material has yielded literally thousands of these in all stages of development. I consider this to be largely due to the stagnation caused by the drought. I had living material under observation for about three weeks, and prepared many slides from it on the spot, in addition to several dozen which I have subsequently obtained from preserved specimens.

When I considered the great number of zygospores, I thought I should be certain to find many conjugating individuals, and, with that idea, I collected fresh material every day. When I returned home I found a large number showing the phenomenon which I had previously failed to recognise.

The condition of stagnation appears to me to be conducive to conjugation. Filaments of *Spirogyra* frequently become coated with débris of various kinds during the process, and the "bacteria" associated with the Glyn material constitute a notable feature. In addition to Desmids, enormous numbers of *Scenedesmus obliquus*, cells of a species of *Torula*, filaments of *Spirogyra* with zygospores, and *Eldogonium* with oogonia, and many larvæ were present.

It is well known that Desmids have the power of locomotion, and that their movements are influenced by light. They usually set themselves so that the longer axis points in the direction of the strongest illumination, and they occasionally swing round on one extremity. These Desmids are almost as broad as they are long, nevertheless the movements probably occur, and the débris with which they are associated acts both as a help and a hindrance in this; it forms a substratum for their support and prevents them from becoming widely separated, so that they become associated in large numbers. It is rather noteworthy that the greater number of Desmids composing this association are almost of the same size, namely $26\ \mu$ to $30\ \mu$; they almost look as if they had been sifted, though there are at least three species present. They may be found in several positions, and their movements seem to be due to gamotactic rather than heliotactic force. The Desmids are arranged symmetrically and asymmetrically, both in front and in apical view as well as superposed.

The three-rayed form of Desmid is more abundant than four-rayed, and, as might be expected, the conjugation of the two three-rayed forms is the most common; I have several times seen the conjugation of a three-rayed with a four-rayed form, but have not yet observed the conjugation of two four-rayed modifications, though I have searched for this. It will be noticed that when the zygospores germinate, three-rayed Desmids sometimes occur in the same protoplasm with the four-rayed forms—that is to say, that the same spore gives rise to both kinds simultaneously. Desmids with a four-rayed end and a three-rayed end are also met with.

In the early stages of the conjugation of the Desmids there is a protrusion of protoplasm from the plants. In a specimen which I had under observation for an hour or so immediately after its removal from the river pool, the granules in the protoplasm were "dancing" conspicuously in this protrusion, and they continued in movement until I was obliged to leave the microscope. The material had dried up when I again examined it. As a rule there is no conjugation tube, and the contents of the two Desmids commingle in the water. I was fortunate enough to secure one specimen, however, in which the somewhat uncommon formation of the conjugation tube was well shown. The total length of the two Desmids and the tube was about $70\ \mu$. The Desmids were about $28\ \mu$ in length and almost of the same diameter. The conjugation tube was about $30\ \mu$ in length, perhaps $35\ \mu$ in extreme measurement, there was some overlapping, and it varied in diameter from $10\ \mu$ to $15\ \mu$. The Desmids were asymmetrically

placed, and there seemed to be a slight indication of difference of sex, as the contents of one Desmid were passing to the other without a corresponding return. The wall or membrane of the tube was very delicate and fragile. There are several examples which have become separated from their conjugating partner and show a small protuberance between the semi-cells. One specimen, which can only be regarded as a monstrosity, has developed a large bulging swelling, apparently well covered by a cell-wall, and it has continued its existence in a distorted form, deciding that it would not die until it was compelled to do so.

I think that it is quite possible that a conjugation tube may be formed more frequently than it is observed; any rough treatment would easily destroy it. Evidence of conjugation without its formation is abundant; this is the only specimen which I have seen with the tube really complete.

The spores are formed in the water between the two Desmids, and, at first, the protoplasm is surrounded by a gelatinous coating which changes into the hardened wall and develops spines. It is difficult to trace the early stages of the nucleus during the process of the growth, as the oil-drops, which constitute a prominent feature of the metabolic processes going on within the zygospore, obscure the other cell-contents. When the cell-contents are set free, they ultimately increase greatly in size, and the oil disappears, doubtless forming food for the young Desmids. If we consider the nucleus of the parents to be haploid and the conjugation nucleus to be diploid (of which I can offer no evidence), the subsequent division of the contents of the spore into four masses is probably of the nature of a reduction division, and this process may be commonly and easily seen. As previously mentioned, there were great numbers of zygospores produced last year, and I obtained many dozen showing this formation of four "Desmid Mother Cells" before the contents leave the spore. The oil-drops have gone, and a tetrad formation appears to have taken place; three nuclei with their surrounding protoplasm and colouring matter are seen in focus at the same time, and the fourth is concealed by the other three; they do not at first fill the spore, but are widely separated from each other and arranged near the spore coats; later they increase in size, and the four masses of protoplasm collectively fill the entire space, the division between them still remaining distinct.

The cell-contents appear to be of slightly lower specific gravity than the spore-coat. The first indication of a germination is the contraction of the plasma membrane, and the cell-contents, in almost every instance, come to the upper surface of the spore; I have seen very few dehiscing laterally—the contents escape in an upward direction; possibly the empty spore-coating sinks; at any rate, the contents do not remain associated with their former abode; the empty cases do not appear in numbers proportionate to those of the developing embryonic Desmids.

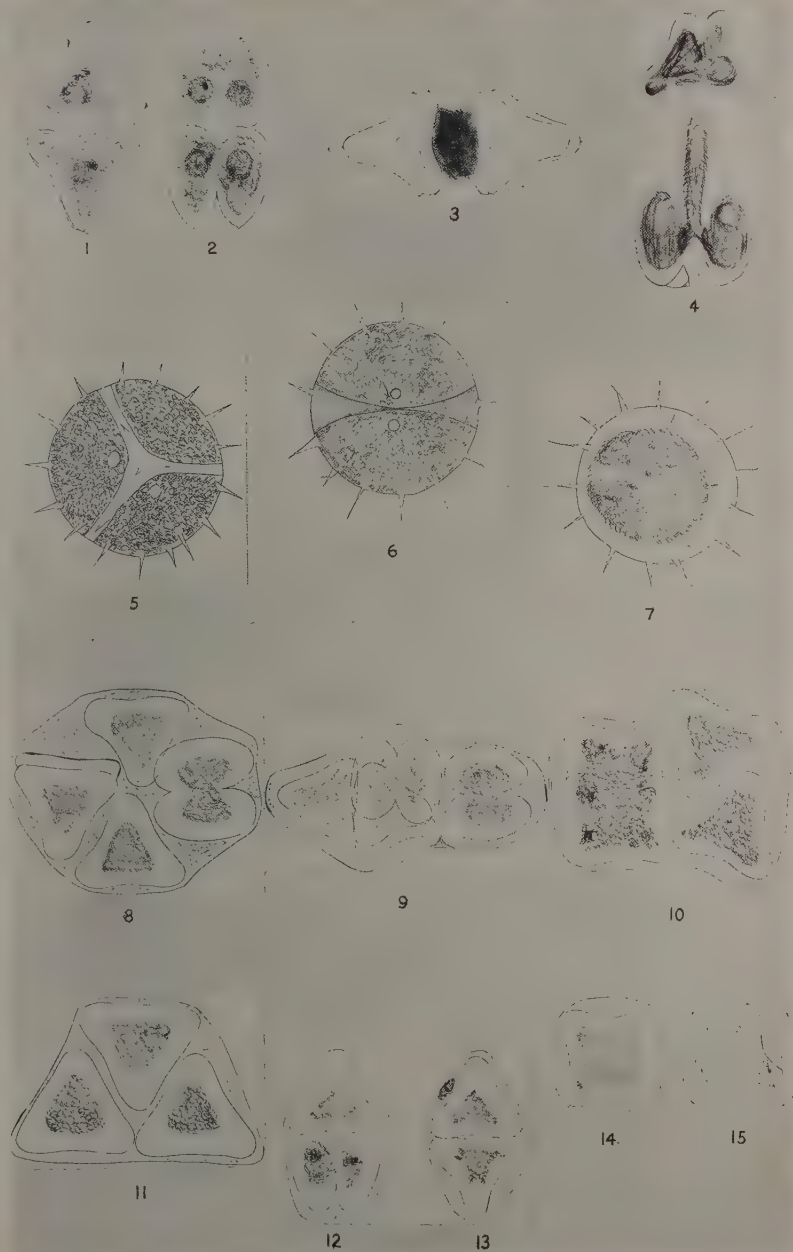
Three or four nuclei may be seen in the escaping contents, and four, three, two, or only one embryonic Desmid may result;

there is frequently an atrophied nucleus when the smaller numbers are formed. The division of the conjugation nucleus into four, and the accumulation of the cytoplasm etc. into four Desmid mother-cells, each with a distinct nucleus, is abundantly shown by my microscope preparations. There are a great many zygospores which show this most clearly. It is to be seen in the spores whilst they are still associated with the old semi-cells of the parent Desmids. The protoplasmic masses at this stage are connected by threads only, and are divided by broad spaces; they appear to increase in size in the older zygospores, many of which show the component parts of the tetrad consisting of naked masses of protoplasm, only separated by the merest line—they are practically in contact, except at the point where three mother-cells approximate. I was some time before I found the division of the cell-contents into two parts; this phase is much less abundant than the tetrad one.

When I find the young Desmids enclosed in the protoplasm, I have no hesitation in saying that they have been formed from the spore. There are many anœboid masses of protoplasm on the slides which do not show this, and they may, or may not, constitute the early stage of the escaped contents. The first indication of the production of the young Desmids is the formation of a hyaline district surrounding a central area, nuclear mass, or masses. These soon show the outlines of the Desmids. I find two almost mature in each mass most commonly: there are few slides out of the several dozen which I have prepared which do not contain at least one specimen showing this; many have three or four. The number showing one Desmid only is approximately the same; the majority are of the tri-radiate form, one or two show the tetra-radiate modification only. The number of clusters of three embryonic Desmids is less than that of the little clusters of two, and I have seen perhaps half-a-dozen clusters of four—the four nuclei do not always survive. I have found four dead, also eight empty semi-cells, enclosed in a surrounding membrane—the remains of the enclosing protoplasm.

The protoplasm surrounding the young Desmids is very granular at first, and I have three or four times seen the same protoplasmic mass containing three-rayed and four-rayed forms. One of the best examples of this escaped capture, one has moved, but I still have one or two slides illustrating this phenomenon.

The vegetative division of the Desmid is sometimes of the normal type, namely that a bulging protuberance is formed by each semi-cell, the two swellings being soon covered by a cell-wall and gradually increasing in size till they reach the dimensions of the old semi-cell. In other instances only one circular central cell is formed between the semi-cells; this sometimes elongates with the production of an hour-glass contraction in the centre, and two Desmids result. In a third method a central heart-shaped cell is formed by the asymmetric division of the bulging portion; the two terminal semi-cells approach each other, the



C. Turner, del. & phot.

Grout, photosc.

LIFE-HISTORY OF A DESMID.

heart-shaped cell begins to divide at its broadest end, and the two Desmids which ultimately result are so arranged that conjugation would be a natural sequel.

I am indebted to Dr. O. Borge, of Stockholm, for very kindly identifying the specimen for me, and a beautiful little sketch of it which he was good enough to draw.

EXPLANATION OF PLATE 1.

Staurostrum Dickiei var. *parallelum*, Nordst.

Figs. 1. & 2. Early stages of conjugation. Fig. 1, vertical view; Fig. 2, front view.

Fig. 3. Conjugation complete, with the early stage of the zygospore.

4. The unusual formation of a conjugation tube.

5. The mature zygospore, showing the contents divided into four (the fourth being concealed by the other three).

6. A zygospore with the contents divided into two parts.

7. The contents of the spore contracted and escaping.

8. The escaped contents of the zygospore, showing four embryonic Desmids (three vertical view, one front view) surrounded by the periplasm.

9. Four Desmids (two vertical view, two front view) with their surrounding periplasm.

10. Three Desmids (one of them a four-rayed form) produced in the escaped contents of a zygospore.

11. The usual arrangement of three Desmids in the escaped contents (vertical view).

Figs. 12 & 13. Two Desmids (fig. 13 with an atrophied nucleus) produced from a zygospore. The arrangement shown in these two figures is most frequently met with.

Fig. 14. An embryonic four-rayed form with its surrounding protoplasm.

15. A Desmid (vertical view), showing a four-rayed end and a three-rayed end in the same individual.

The Desmids are 26μ to 28μ in length, and are of the same diameter. The zygospores are 35μ to 38μ in diameter, without the spines, which are 8μ to 10μ in length, making a total diameter of 50μ to 55μ .

Furia infernalis, Linnæus.

By Sir ARTHUR E. SHIPLEY, G.B.E., F.R.S., F.L.S.

[Read 15th June, 1922.]

IN the classical tenth edition of his 'Systema Naturæ,' that of 1758, Linnæus gives on page 644 the following list of genera of his Group *INTESTINA*: *Gordius* with three species, *Furia* with one species, *Lumbricus* with two species, *Ascaris* with two species, *Fasciola* with two species, *Hirudo* with eight species, *Myxine* with one species, *Teredo* with two species.

Myxine, the cyclostome fish, and *Teredo*, the boring mollusc, obviously had nothing to do with the *INTESTINA*.

Altogether his characterisation of the species enumerated above occupies only four and a half pages.

The history of *Furia* is a curious one. Dr. Daydon Jackson records in his interesting article on Linnæus in the 'Encyclopædia

Britannica' that "whilst botanising in the spring of 1728, Linnæus was attacked by what he considered to be a venomous animal, afterwards named by him *Furia infernalis*, in allusion to the torment and danger he suffered from it."

The following is a translation of Rudolphi's remarks on *Furia**:—

"With Blumenbach and others of our more recent writers I exclude *Furia*, a creature never seen by observers of nature spoken of as a worm and yet as flying in the air. Should you, however, incline to believe in such an animal it most assuredly will not belong to the Vermes, but will be the larva of an insect perhaps.

"627. *Furia infernalis* vermis et ab eo concitari solitus morbus descripti a Dan. C. Solander. In Nov. Act. Upsal. vol. i. pp. 44–58.

"Versio germanica: D. Solander's Treatise on the Mordwurm and the disease caused thereby. Translated by J. A. E. Goeze in Der Naturforscher, St. xi. pp. 183–204.

"That Linnæus (Amœn. Acad. vol. iii. p. 322) regarded it as a dry worm (vermen siccum), but so elusive (evanidum) that it was not possible to define its genus or species. Neither did Solander ever see it, but constructs its character from accounts derived from other people: body filiform, continuous, equal, ciliated on both sides with reflexed adpressed spurs. That it descends from the air upon men and beasts and causes a disease called Skott—that is, stroke (ictum): very frequent in Northern Sweden, particularly in Lapland Torneânsi et Kjemensi.

"Analecta towards the history of *Furia infernalis* Car. Godofr. Hagen, [Præs., resp. C. Metzger] Regiomontan., [1790] 22 pp. 4to. For the existence of *Furia*, although he concedes the little creature (animalculum) never to have been seen by any person worthy of credit. Query: whether it is right to admit things of this sort into a system.

"Slågtet Döds-skott (*Furia*) by Adolph Modeer. In Nya Vetensk. Akad. Handl. 1795, pp. 143–167. Puts forward many things about the *Furia infernalis*, and classes it in the same genus with that fabulous little creature (animalculo) the *Filaria medinensis* (which he wrongly supposes to have bristles), a thing greatly to be reprobated."

The following account of the incident is taken from the Diary of Linnæus, translated for Maton's edition of Pulteney†:—

"In the spring of 1728, Linnæus went in a herborising excursion with Matthias Benzelstierna, to a very pleasant spot at Fågle-sång, where, having taken off some of his clothes on account of the heat, he was bitten in the right arm by a worm, called *Furia infernalis*. The arm immediately became so violently swollen and

* 'Entozoorum sive vermium intestinalium Historia Naturalis,' vol. i. p. 171 (1808).

† 'A General View of the Writing of Linnæus,' by Richard Pulteney, London. 1805. 2nd edition, p. 516.

inflamed that his life was endangered, especially as *Stobæus* being about to set off for the Mineral waters of *Helsingborg*, he was left to the care of * * *. Snell, however, having made an incision, the whole length of his arm, restored him to his former health. He passed, therefore, the summer vacation with his parents in Småland."

Nobody seems to have been able to identify this "*pessima omnium*," as it is called in the Tenth Edition. We may, I think, follow the example of Railliet and regard it as one of the "*parasites fabuleux*." What probably stung Linnæus was a virulent insect, which may very well have conveyed to his system some pathogenic germs unknown in the time of the great systematist.

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No. 8. Crustacea, Pt. VI. Tanaidacea and Isopoda. By W. M. TATTERSALL.

No. 9. Insecta, Pt. I. Collembola. By GEORGE H. CARPENTER.

Insecta, Pt. II. Mallophaga. By JAMES WATERSTON.

Vol. IV. No. 1. Protozoa, Pt. I. Parasitic Protozoa. By H. M. WOODCOCK and OLIVER LODGE.

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(The following Obituary was received too late to be inserted on page 49.)

WALTER GEORGE RIDEWOOD, who died on 21st September 1921, was born in London on 1st February 1867, and studied at the Royal College of Science from 1883 until 1887. He was interested in zoology, and from 1881 until 1917 he held a temporary appointment in the British Museum (Natural History). During most of this period he was also lecturer on Biology in the St. Mary's Hospital Medical School. He was especially skilful in making anatomical preparations, and a very large proportion of those in the central hall of the Museum are his work. While occupied with the preparations he availed himself of every opportunity for original observation and made many important contributions to our knowledge of the anatomy of the Vertebrata. His early paper on the structure and development of the hyobranchial skeleton and larynx in *Xenopus* and *Pipa*, published in the Journal of the Linnean Society, vol. 26, was his thesis when he received the degree of D.Sc. from the University of London in 1897. His later researches on the skull of certain Teleostean fishes, published partly by the Linnean Society, partly by the Zoological Society, were intended to be incorporated in a volume on the osteology of fishes, which unfortunately he never completed. His last memoir, on the structure of the vertebræ of sharks and rays, was an especially valuable work published in the Philosophical Transactions of the Royal Society in 1921. He also published a memoir on the gills of lamellibranch Mollusca in the Philosophical Transactions in 1903, and new observations on *Cephalodiscus* in the Report of the British Antarctic (Terra Nova) Expedition in 1918. Dr. Ridewood was elected a Fellow of the Linnean Society on the 2nd March, 1893, and served on the Council from 1903-06 and 1910-14. [A. S. W.]

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NOTES
ON A
CATALOGUE
OF THE
LINNEAN HERBARIUM.

BY
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KNIGHT OF THE SWEDISH ORDER OF THE POLAR STAR,
HON. PH.D., & A.M., UPSAL;
GENERAL SECRETARY OF THE LINNEAN SOCIETY OF LONDON.

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M. Brongniart fait remarquer combien il est regrettable que l'on n'ait pas encore songé à publier un simple catalogue de l'herbier de Linné.—Bull. Soc. Bot. Fr. xiii. (1866) p. 135.

FOREWORD.

THE manuscript to which this refers is intended to supply an answer to questions which an enquirer is apt to put when examining Linnean specimens; the explanations are purposely shortened so as to compress the remarks into a moderate compass, usually a single line, but when more is needed, it is supplied on the opposite page (verso).

Certain frequent abbreviations are:—

A. = Alströmer.	K. = Kalm, König.
Ard. = Arduino.	Kb. = Kaehler.
Br. = Browne.	L., Loeßl. = Löffling.
C.B.S. = Caput Bonæ Spei = Cape of Good Hope.	M. = Magnol.
D. = Dickson.	R. = Roÿen.
Gerb. = Gerber.	S., Sm., J. E. S. = Smith.
Gmel. = Gmelin.	T. = Thunberg, Tulbagh, Turner.
H.B. = Herb. Banks.	V ^o = Verso, the left-hand page; the back of the Recto, the right- hand page.
H.L. = Herb. Linn.	
H.U. = Hort. Upsal.	
Hall. = Haller.	
Jacq. = Jacquin.	

Most of the Linnean contractions are expanded; other signs are explained in the 'Index' published in 1912, but republished here after revision.

For use of the remarks, the sheets of each genus in the herbarium are numbered at the top left-hand corner in green ink; these numbers refer to those in the first column of the manuscript Catalogue, then followed by the name of the species where given, and the number belonging to the species in the first edition of the 'Species Plantarum' 1753, when used by Linné; in a few cases the number is written without the name. Additions made in the 'Systema' ed. X. were denoted by capital letters in place of numbers, and these are also cited. Occasionally

figures in pencil may be seen upon the sheets; these are due to the preliminary attempt effected in 1747-50, which is still preserved, see Dr. J. M. Hulth's account of Linné's first sketch of his 'Species Plantarum' in the *Svensk Bot. Tidskr.* vi. (1912) 627-631.

The handwriting of Linné is simply copied; where nothing is added, it is his alone (the figures in the first column and the running numbers of the genera excepted). The handwriting of everyone else is shown by its being underlined, or in parentheses, or brackets; the cataloguer's comments are shown by an initial J. Long sentences on the face or the back of the sheets are shortened by omission of the middle, the beginning and the end being given before the name or sign of the writer. Labels as a rule are not copied, but the writer's name when known is given; as the label is open to the inspection of the enquirer, it does not need to be set out. Amongst the Mosses will be found many additions by James Dickson, who not only gave his opinion to Sir J. E. Smith, but largely added to the material; these are shown by the initial D.; the water-mark on these sheets is English.

Many of the numbers written on the sheets by Linné refer to books, as, for instance, 'Flora lapponica' and 'Flora suecica,' though not specified; others correspond to lists sent by correspondents, such as Tulbagh (*cf.* *Proc. Linn. Soc.* 1917-18, *Suppl.*), Alströmer (MS. of consignments in 1762, kindly supplied by Dr. J. M. Hulth), Allioni, Arduino, Sparrman and Thunberg, though the last two are not available.

A full account of the herbarium was issued in the Society's 'Proceedings,' 1911-12, *Suppl.*; as fresh information has accrued since that was issued, the introductory matter has been revised and reprinted in the following pages, as a Supplement to the 'Proceedings' for 1921-22.

B. DAYDON JACKSON.

Burlington House,
December, 1921.

INTRODUCTION.

IN the autumn of 1906 a suggestion was made to the Council of the Linnean Society of London, that a Catalogue of the contents of the Linnean Herbarium, together with a series of photographic illustrations of selected types from it, would be an appropriate publication for the celebration of the 200th anniversary of the birth of Carl von Linné.

Experiments showed that a fairly complete Catalogue of the sheets in the herbarium in question, would extend to about three volumes of the Society's Journal, and that its compilation would require from fifteen to eighteen months; the suggestion was therefore found to be impossible of fulfilment, quite apart from its cost. The second proposal was entertained by the Council so far as preparing estimates of the cost of issuing a series of 100 collotype plates, the actual size of the specimens, provided one hundred subscribers at a given rate were forthcoming, but as only seventeen subscribers offered, that project also fell through.

In order in some measure to meet the wishes expressed, the Council sanctioned the printing of a catalogue of generic names in the Linnean Herbarium in the original sequence, with the number of the sheets under each, followed by an alphabetical index, and preceded by an account of an enumeration by Linné himself of the plants possessed by him in 1755; advance copies were printed and distributed before the 23rd May, 1907, and reissued in the 'Proceedings' in October of that year.

INTRODUCTION.

Though the original project could not be carried out, it was not forgotten, and in 1911 it occurred to the compiler, that an index on a modest scale, showing by special type every plant authenticated by the author himself, or at his dictation, would be acceptable; the 'Index' was the result.

The Linnean sequence has been preserved in the herbarium as far as possible, and more than one hundred specimens which had been transferred by Smith to other genera have been replaced, so that the Linnean material is again brought together. As an instance, Smith removed 4 species from *Oldenlandia* to *Hedyotis*, thereby obscuring Linné's conception of the former genus. A few slight slips of the pen have been disregarded, but important variations of name have been noted. The zoological genera in the herbarium were not catalogued specifically until the MS. catalogue was prepared. The total number of sheets is as follows:—

Sheets of plants.....	13,832
Zoological, as <i>Flustra</i> , etc.	99
Undetermined	284
Total	<u>14,215</u>



A view of the Linnean Herbarium at the present time. The doors are open, showing the twenty-one steel boxes which contain the parcels of plants; one box is open, showing the ends of the parcels, one of which is placed at the bottom. The doors have double steel sheets with asbestos between them, and the cabinet is lined throughout with the same fire-proof materials.

Before the recent war, the herbarium was kept in the three painted wooden cabinets used by Linnæus, and the cabinet had glazed doors, but the risk of damage by enemy aircraft caused the adoption of the changes above indicated.

THE LINNEAN HERBARIUM.

THE Linnean herbarium itself is known at home and abroad to many botanists, who have consulted it, but to the modern systematist, accustomed to good specimens accompanied by full information on the collector's tickets, it may be disappointing. The paper is small, $12\frac{1}{2}$ by 8 inches (32 cm. $\times$ 20.5 cm.), and the information when given is often meagre. Linné evidently trusted to a strong and retentive memory, so that his notes are very brief, or little more than arbitrary sigus to remind him of the source of the specimen. The specimens are usually authenticated by a number, namely, that prefixed to the species in the first edition of the 'Species Plantarum' in 1753, followed by the specific or "trivial" name; the species added to his collection up to the 10th edition of his 'Systema Naturæ,' vol. ii. 1759, are shown by capital letters, in the case of *Hedysarum* extending from A to L. With the second edition of the 'Species Plantarum' in 1762-3, an entirely new series of numbering was used, and in the latest (12th) edition of the 'Systema Naturæ' in 1767, additions were numbered on, but put nearest to their allies, disregarding their numerical order; this enlarged numbering was not employed in the herbarium.

In small or moderately large genera, one cover suffices; at the bottom left-hand corner is the generic name written by Linné, but in the case of monotypic genera, the number "1" is often the only authentication on the species-sheets. I have in such cases printed the name as being non-existent, but have put (pl.) after it, to show that the type is there, though not verified under the hand of the author. Similarly, all names in *italic* type are names either not vouched for by Linné, or are absent from the collection; the names written by him are printed in ordinary Roman type; where the name has been written by an amanuensis, I have added (m. Sol.)=manu Solandri, or other assistant as the case may be. It is only where I am convinced by the special circumstances of each case, that I have allowed myself this licence. Thus, we have the distinct assurance from Sir J. E. Smith, that Solander wrote all the specific names to Patrick Browne's specimens (Linn. Corr. i. 43), and if corroboration be wanted, in the Linnean library there is a copy of Browne's 'History of Jamaica' with the Linnean trivial names written in the margin by Linné himself. Other amanuenses were Olof Söderberg, Gabriel Elmgren, J. P. Falk, Pehr Löfling, Erik Gustaf Lidbeck, Anders Dahl, and the younger Linné. As to the first and second, I am unable to assert that their writing is in the herbarium; but when the writer is, so far as I am concerned, uncertain, I have shown it by adding (m. am.)=manu amanuensis. The handwriting of the others is known, from some

of whom, *e.g.* Löffling, many letters are preserved in Linné's correspondence, and this valuable body of letters has been constantly appealed to for information or confirmation.

PLAN OF (1912) INDEX.

The method of framing the index was as follows. A list of all names of genera and species issued by Linné was drawn up, chiefly from Petermann's Index to Richter's 'Codex Linneæus,' with some additions and corrections. The herbarium was then examined sheet by sheet, and the Linnean names marked against the list. Many manuscript and unpublished names have been found, and are distinguished by the affix (MS.); further, a fair number of species which were published in the 'Supplementum' of the younger Linné in 1781, have been marked as in (Suppl.). These last are of interest as making certain which species were described by the elder Linné, about 189 in all, for the book itself gives no clue as to authorship. I may remark parenthetically, that the manuscript of the 'Supplementum' sheds but little light upon this question, as the earlier part has been copied by another hand, and practically none of it remains in the handwriting of Linné.

EARLIER ENUMERATIONS.

The next step was to collate certain enumerations existing in Linné's writing.

1. An interleaved copy of 'Species Plantarum' ed. 1, 1753, in which the number before each species then possessed by Linné is underscored. This was copied by Jonas Dryander in or about 1785, when the Linnean and Banksian herbaria were collated (Proc. Linn. Soc. 1887-88, p. 28; Smith in Linn. Lachesis, pref. p. ix.). A transcript of this copy is also at Kew (Proc. Linn. Soc. 1906-7, p. 91). I found in the Linnean copy that the printed pages 849-856 inclusive had been cut out, the interleaves alone remaining; as the Banksian copy has no marks on the corresponding pages, it is clear that these pages were already missing when the Linnean books came into the possession of Smith.

2. A manuscript list described in the 'Proceedings' 1906-7, pp. 90-95: it was brought down to the spring of 1755, most of the marking being by dots prefixed.

3. A copy of the second volume of the twelfth edition of the 'Systema Naturæ,' 1767, the numbers of the species represented in the Linnean herbarium being underscored as in No. 1.

The collation of these three Linnean lists, with the actual noting from the herbarium as it now exists, permits of a few observations being made. Each of these lists is faulty; the third especially so, for such genera as *Althæa*, *Philomis*, and *Pulmonaria* have escaped marking altogether; pages 408 and 409 have been

turned over together, so that three small genera and the first third of *Antirrhinum* have been missed, though the remainder of the latter has been duly marked; such omissions show that the marking was done from memory. *Trifolium comosum* is not in the herbarium now, and was not noted in 1753 nor 1767, but was so in 1755; in all probability the dot in the manuscript catalogue is an error, and the plant was at no time in Linné's possession.

CONTRIBUTORS TO THE HERBARIUM.

At the hundredth anniversary of this Society on 24th May, 1888, I gave an account so far as then ascertainable of the contributors to the Linnean herbarium (Proc. 1887-8, pp. 18-22). Since then fresh information has been obtained from Prof. T. M. Fries's 'Linné,' 1903, the early volumes (i.-vi.) of the correspondence of C. v. Linné (Bref och skrivelser) and my examination of the entire collection. The last word cannot be given as yet, but when the whole of the letters are printed, it will be easier to add to the present account, than it is now to give a complete presentation. The following may be considered as the chief contributors to the herbarium:—

- AHLELÖF, JONAS JOACHIMSON (1717-1783), a pupil of Linné, afterwards rector of Frillesås.
- ALLAMAND, FRÉDÉRIQUE (fl. 1770-86), born at Lausanne, graduated at Leyden in 1749, and communicated Surinam specimens from 1756 to 1771 and later.
- ALLIONI, CARLO (1725-1804). Italian alpine plants.
- ALSTRÖMER, BARON CLAS (1736-1794). Prof. T. M. Fries states that during his travels in Spain and the South of Europe, from 1760 to 1764, the Baron sent to Linné no fewer than 1550 dried plants, 250 sorts of seeds, 202 shells, 60 corals, and 94 fishes, with many living plants, bulbs and roots. These numbers rest upon the correspondence, as I do not find so many tickets or memoranda from him in the herbarium; some sheets are marked "A." Linné speaks of receiving "several packets, which he had partly collected himself and partly received from others"; possibly many were exchanged or given away.
- AMMANN, JOHANN (1707-1741), born at Schaffhausen, died as Professor of Botany at St. Petersburg; during his short life, he corresponded and sent dried plants.
- ANKARCRONA, ADMIRAL THEODOR CHRISTOPHER, afterwards ennobled (1687-1750). With other plants communicated *Phaseolus radiatus* about the year 1742.
- ARDUINO, PIETRO (1728-1805); sent many plants, which are usually marked "Ard." close to the base of the stem.
- ARGILLANDER, ABRAHAM (1722-1800); communicated Swedish and Finnish plants.

- ASCANIUS, PEDER (1723-1803), a pupil of Linné, who devoted himself to zoology and mineralogy; his name is mentioned as a contributor to the *Centuria secunda* (Am. Acad. iv. 330).
- BÄCK, ABRAHAM (1713-1795), Linné's most intimate friend, from whom he received occasional gifts of plants.
- BÆLTER, SVEN (1713-1760), Chaplain to a Russian embassy; sent a few plants from Russia.
- BANKS, Sir JOSEPH (1743-1820); sent specimens of *Banksia*.
- BARNEDES, MIGUEL (d. 1771). Spanish plants. Alströmer, Hallman, and Löfving were personally acquainted with him.
- BARRÈRE, PIERRE (1711-1755). European plants, chiefly from France.
- BARTRAM, JOHN (1699-1777), "King's botanist in America"; a few plants from the North United States; some through Dr. Alex. Garden.
- BASSI, FERDINANDO (1710?-1774), Prefect of the Bologna garden, whence he sent plants. Lasègue (Mus. bot. Deless. 359) states that Bassi and V. Donati sent Forsskål's Arabian plants to Linné, on what authority I know not, but as Donati died in 1762 and Forsskål in 1768, there is proof of a blunder.
- BASTER, JOB (1711-1775). A collection of plants from Java, more than 300 in all.
- BERGEN, CARL AUGUST VON (1704-1759), professor at Frankfurt-on-the-Oder.
- BERGIUS, PETER JONAS (1730-1790), a pupil of Linné, settled at Stockholm as an eminent physician; collected plants in Gotland; best known for his volume '*Descriptiones plantarum ex Capite Bonæ Spei*,' 1767.
- BERLIN, ANDERS (1746-1773). European plants, and some from Guinea, where he died.
- BIÖRLIN, M.; sent a specimen of *Globularia* from Natolia.
- BJELKE, Baron STEN CARL (1709-1753). Visited Russia in 1774, whence he sent MS. catalogues of plants from Russian collectors, and plants also.
- BLADH, PEHR JOHAN (1746-1816). Resident for some years at Canton; some Chinese and Cape plants in the herbarium possibly came through Thunberg.
- BLOM, CARL MAGNUS (1737-1815); cf. '*Bref och skrivv.*' I. iii. 270. *Hydrangea arborescens*.
- BRAAD, CHRISTOPHER HENRIK (1721-1781); supercargo in the Swedish East India Company's service, who brought home plants from Surat and other Asiatic ports.
- BRANDER (afterwards SKJÖLDEBRAND), ERIK (1720-1814). Swedish consul at Algiers from 1753 to 1765; sent insects and a few plants from North Africa.
- BREYNE, JOHANN PHILLIPP (1680-1764). His contributions are mentioned in the '*Hortus Upsaliensis*.'

- BROWNE, PATRICK (1720-1790). Born in Ireland, he practised as a doctor in the West Indies, and published in 1756 a folio volume on the Natural History of Jamaica; his herbarium was bought by Linné through Collinson in 1758 for £8 8s.; the purchaser marvelled that the English should let so fine a collection slip through their hands for "100 plätar," that is, double what it cost Linné. The specimens are denoted by "Br." in Linné's hand, but the names were written by Solander at the extreme bottom of each sheet, presumably from the printed volume which Linné annotated, 347 being noted; cf. Smith, Linn. Corr. i. pp. 42-44.
- BURGESS, Rev. Dr. JOHN (fl. 1771-1805), lichenologist at Kirk-michael, Dumfries.
- BURMAN, JAN (1706-1779), eminent Dutch botanist; contributed Cape and Javan plants; father of
- BURMAN, NICOLAUS LAURENT (1734-1793). Visited Uppsala in 1760, and afterwards was a frequent correspondent.
- "CAPELL." = Capellanus, Chaplain; used by Linné for Frater Gabriel, of Aix.
- CATESBY, MARK (1680-1749), author of the 'Natural History of Carolina,' etc.
- CELSIUS, OLOF, the elder (1670-1756). Linné's early benefactor in his Uppsala student period. He returned to the botanic garden plants he had taken thence when the place lay in neglect.
- CLAYTON, JOHN (1686 or 1693?-1773). Born in Middlesex, collected in Virginia, sent plants to Gronovius, who published his 'Flora Virginica' in 1739-43. Linné says:—"When I assisted Dr. Gronovius in examining plants from Virginia, I got duplicates of most of them." The labels to these are in the handwriting of Gronovius.
- CLIFFORD, GEORGE (1685-1760). Linné's patron at Hartecampe, near Haarlem, who "had an excellent herbarium from which he gave me all the duplicates"; (see also 'Sp. Pl.' ed. 2. præf.). These are recognisable by their good thick paper, which has been cut down from the original size, 18" x 11" (45.5 cm. x 28 cm.) to the small size noted on p. 9. They amount to about 100 sheets, most of them still further marked, by portions of the printed vase at the base of the stem of the specimen, or the ticket at the left hand at the bottom, marks well-known to those who have referred to Herb. Clifford. at the British Museum.
- COLLINSON, PETER (1694-1768). Contributed plants from his garden; bought Browne's herbarium on behalf of Linné in 1758.
- CRONSTADT, Count CARL JOHAN (1709-1779) [not "Jakob"].
- DAHL, ANDERS (1751-1789). The records in the herbarium are probably only as an amanuensis; his names are on the back of each sheet, close to the bottom.

- DAHLBERG, *Colonel* CARL GUSTAF (fl. 1754-75). A Swede residing in Surinam; during a visit to his native country in 1754, he invited Rolander, then a promising pupil at Uppsala, to return with him. Plants were sent to Linné from Dahlberg, including those which came through the King (Gustaf III.), which were the last upon which Linné was able to do any botanic work; many were published in the 'Supplementum.'
- DALBERG, NILS (1736-1820), a brother of the last, though he spelled his name differently; a student at Uppsala, became eminent as a medical man, and enthusiastic naturalist.
- DALMAN, JOHAN FREDRIK (1726-1809). Sent some plants from India, the result of a voyage thither in 1748.
- DE GEER, *Count* CHARLES (1720-1778). Eminent entomologist; having assisted Rolander with funds for his South American journey, the latter on his return gave all his plants to De Geer, "who made me a present of every one of them." Not a single plant seems to have been given direct to Linné.
- DÉMIDOFF, *Prince* GRÉGOIRE (fl. 1750-60). In a letter dated 15th May, 1750, he spoke of his collection of more than 800 plants sent to Linné for naming, with permission to retain duplicates. Amongst these came Steller's from Kamtschatka, Gerber's from Astrachan and the River Don, and Lerche's from Persia. The following March he thanked Linné for his work, and said that the Moscow plants were of his own gathering. Karamyschew regretted that all were not allowed to remain in Linné's possession (*Am. Acad.* vii. 447).
- DICK, JACOBUS (d. 1775), of Spiez, near Thun, Switzerland; a pupil of Haller, and friend of Jacquin. His herbarium was bought by Sir Joseph Banks. *Cf.* *Jacq. Hort. Vindob.* iii. 12; *Ep. ad Haller*, v. 141; 284-291. *Journ. Bot.* (1902) 389; (1904) 357-358; (1909) 272-273. This name is attached to a few plants in the herbarium, sent by Gessner in 1763, as collected by Dick and Fueslin in the Rhetian Alps.
- DILLENIUS, JOHANN JAKOB (1687-1747). "Many from the garden at Oxford."
- DONATI, VITALIANO (1717-1762). Said to have sent Forsskål's Arabian plants to Linné, but the dates disprove this.
- DUCHESNE, ANTOINE NICHOLAS (1747-1827). Specimens of *Fragaria*, named.
- DU ROI, JOHANN PHILIPP (1741-1785). Plants from Brunswick, Hortus Harbeccensis; Harbke, near Helmstedt; he was author of 'Die harbkeschische Baumzucht.' Braunschw. 1771-2; Ed. II. by J. F. Pott, *ib.* 1791-1800.
- EHRHART, FRIEDRICH (1736-1795). Many specimens named by him, especially amongst the cryptogams.
- EKEBERG, CARL GUSTAF (1716-1784); Captain of an Indiaman, who brought plants to Linné from tropical Asia.
- ELLIS, JOHN (1711-1776), a London merchant and friend of Peter Collinson; these two were Linné's most constant

- English correspondents; Ellis sent American plants and specimens of *Corallina*.
- ESCALON, —. (fl. 1777). Plants sent through Mutis.
- FABRICIUS, JOHAN CHRISTIAN (1745–1808). After studying two years at Uppsala, became Professor at Copenhagen and afterwards at Kiel; eminent as an entomologist, see Linné's remark quoted under Zoega. A few plants sent to Linné.
- FAGRAEUS, JONAS THEODOR (1729–1797). Studied at Lund and Uppsala; afterwards custodian of Baron C. Alströmer's collections at Alingsås.
- FALCK (or FALK), JOHAN PEHR (1733–1734). Sent plants from Russia, also from Gotland.
- FERBER, JOHAN JAKOB (1743–1790). Specimens sent during his travels in the South of Europe.
- FEUILLEE, LOUIS ECONCHES (1660–1732), French explorer: cf. *Physalis*, sheet 12.
- FORSSKÅHL, JOHAN CHRISTIAN (1725–1756), brother of the following, in spite of the varied spelling; sent plants from Finland.
- FORSSKÅL, PEHR (1735–1768). Plants from Germany; afterwards made collections of plants and animals in Egypt and Arabia, published by C. Niebuhr, the sole survivor of the expedition. Zoega wrote the text of 'Flora ægyptiaco-arabica,' Havnæ, 1775.
- FORSTER, JOHANN GEORG ADAM (1754–1794), son of the next named; accompanied his father on Cook's second circumnavigation; afterwards Professor at Wilna.
- FORSTER, JOHANN REINHOLD (1729–1798). Naturalist on board the 'Resolution,' with George Forster and A. Sparrman. Sundry plants were supplied to Linné from the Southern hemisphere.
- FOTHERGILL, JOHN (1712–1780). Corresponded with Linné, and sent him both plants and animals.
- FUESLIN (fl. 1770). Collected with J. DICK.
- GABRIEL, *Frater* [*Baron DE LATOURDAIGNES?*] (fl. 1757–1768). Plants sent from Aix in Provence; the collector was a Capuchin friar: cf. Cotta, J., C. Gerber et M. Godefroy; Une lettre inédite de Linné au frère Gabriel, apothicaire des Capucins d'Aix.
- GAHN, HENRIK (1747–1816). Specimens sent from England, where he was offered the chance of taking part in a voyage of exploration; his decision to decline the proposition seems to have annoyed Linné.
- GARDEN, ALEXANDER (1730–1816). Plants, etc., from Carolina, principally through Collinson and John Ellis.
- GERARD, LOUIS (1733–1819). Provençal plants.
- GERBER, TRAUGOTT (fl. 1739–1741), Prefect of the Moscow Medical Garden; drew up lists of plants observed near the rivers Volga and Don, which lists were sent by Baron Bjelke to Linné, and some of the plants by Prince Démidoff.

- GESSNER, JOHANN (1709-1790), of Zürich, where he was professor of mathematics and physics, at the same time the friend and correspondent of Haller and Linné; Gessner communicated Dick's plants.
- GLEDITSCH, JOHANN GOTTLIEB (1714-1786). professor in Berlin.
- GMELIN, JOHANN GEORG (1709-1755). Spent 1733-1743 in Siberian exploration for the Russian Government; from 1749 professor in Tübingen. Linné's statement is:—"On Gmelin's return from Siberia, . . . he gave me a specimen of every plant he had collected, in order to learn my opinion of each." Steller was one of Gmelin's assistants.
- GORDON, JAMES (d. 1783), Nurseryman at Mile End, 1750-1776; sent living plants to Linné.
- GORTER, DAVID VAN (1717-1783). Became physician in the Russian service; sent plants from Russia.
- GOUAN, ANTOINE (1733-1821). Constant correspondent, sending material from Montpellier and its neighbourhood. His labels are extremely neat.
- GRONOVIIUS, JAN FREDRIK (1690-1762). An early friend and supporter of Linné when in Leyden; sent Clayton's duplicates which came from Virginia.
- GUNNER, JOHAN ERNST (1718-1773), bishop of Trondhjem, and author of 'Flora norvegica'; a few marine algæ sent to Linné.
- GUSTAF III. (1746-92), King of Sweden; presented Surinam plants preserved in spirit: cf. Am. Acad. viii. 249-267, t. 5 (ed. 3). *Gustavia*, Linn. (Myrtaceæ).
- HAGER, JOHAN HENRIC (d. 1770), pupil under Linné at Uppsala, afterwards M.D. at Lund; supplied *Tussilago alba* from Småland.
- HAGSTRÖM, JOHAN OTTO (1716-1792). One of Linné's cleverest pupils; he wrote on bee-flowers.
- HALLER, ALBRECHT VON (1708-1777). Seems to have supplied a few specimens only.
- HALLMANN, DANIEL ZACHARÆ (1722-1782). Specimens from Spain.
- HASSELQUIST, FREDRIK (1722-1752). Sent to Egypt and Palestine; died at Smyrna. Queen Lovisa Ulrika redeemed his collections, and Linné received specimens of each when there were three. Linné says:—"I have a specimen of every one of the plants found by Hasselquist in Anatolia, Egypt, and Palestine." This seems to be exaggerated, as the list I have taken out of the plants marked as collected by Hasselquist, falls far short of the number cited by Linné as observed by the traveller in 'Flora Palæstina' (Am. Acad. iv. 449-467).
- HEBENSTREIT, JOHANN ERNST (1702-1757). Plants from the East.
- HEINZELMANN, JOHANN GOTTFRIED (fl. 1732). Historiographer to the Russian government; recorded plants from Astrachan.

- HOLM, JÖRGEN TYGE (1726-59). Danish student and respondent under Linné; returned to Copenhagen and died the same year. Sent *Atriplex pedunculata* from Denmark.
- HOUSTON, WILLIAM (1695-1733). American plants received through P. Miller.
- HUDSON, WILLIAM (1730-1793). Author of the 'Flora anglica.'
- JACQUIN, Baron NICOLAUS JOSEPH VON (1727-1817). A valued correspondent; most of his tickets were pasted down by Linné. Plants from America, Austria, and many from gardens.
- JUSSIEU, BERNARD DE (1699-1776). Seeds to Linné in large quantity for the Uppsala garden during many years; many plants reared from them, no doubt, are concealed under the initials H. U.=Hortus Upsaliensis: "he also gave me a great many dried specimens."
- KÄHLER, MARTIN (1728-1773). Chiefly plants from Italy; many are marked "Kh."
- KALM, PEHR (1715-1779). This pupil of Linné travelled from 1747 to 1749 in North America and Canada; he "collected a vast number . . . and gave me one of each." These specimens are marked "K."
- KLEYNHOF, CHRISTIAEN (fl. 1761-65), "who formed the largest botanical garden in Java, and there raised a great many East Indian plants, on his return home to Holland, sent us a large trunk full." Some Japanese plants are also recorded from him.
- KÖNIG, JOHAN GERARD (1728-1785). Several hundreds of plants from Iceland and Southern India; the latter are labelled with the collector's own tickets, and sometimes annotated by the younger Linné.
- KRASCHENINNIKOW, STEPHAN PETROVIC (1713-1755). Siberian plants.
- KUHN, ADAM (1741-1817), pupil under Linné, afterwards Prof. of Medicine at Philadelphia; sent *Clinopodium incanum* from North America.
- LAGERSTRÖM, MAGNUS (d. 1759). Engaged in the East Indian trade; communicated some Asiatic rarities to Linné.
- LATOURETTE, MARC ANTOINE LOUIS CLARET DE (1729-1793). Many specimens noted as contributed by him.
- LAWSON, ISAAC (fl. 1734-1759). A Scottish graduate of Leyden, and a generous friend to Linné. D. Z. Hallman met him in London in 1759.
- LAXMANN, ERIC (1737-1796). A correspondent of Linné who sent Siberian plants.
- LECHE, JOHAN (1704-1764). A few sheets from his herbarium written up by him.
- LE MONNIER, LOUIS GUILLAUME (1717-99). French prof. botany; sent Pyrenaean plants.
- LERCHE, JOHAN JAKOB (1703-1780). Persian plants; some from Astrachan were received in 1735.

- LEYSER, FRIEDRICH WILHELM VON (1731-1815). Sent a few plants from Central Europe.
- LINNÉ, CARL VON (1707-1778). See separate account on p. 21.
- LINNÉ, CARL VON (1741-1783), son of the foregoing. Chiefly as amanuensis, and editor of the 'Supplementum.' Most of his own collections are incorporated with Smith's herbarium.
- LISTER, MARTIN (1638?-1712). Contributed *Lycopodium denticulatum* from Portugal.
- LÖFLING, PEHR (1729-1756). Amanuensis and favourite pupil; sent Spanish and Spanish American plants to Uppsala, most of which are marked "*Hispan. Löfl.*"
- LOUREIRO, JUAN (1715-1796). Plants from Cochinchina; afterwards brought out his 'Flora cochinchinensis,' 1790.
- LUDWIG, CHRISTIAN GOTTLIEB (1709-1773), professor in Leipzig.
- MAGNOL, PIERRE (1638-1715). His herbarium was bought by Sauvages, and presented to Linné; most of the specimens are marked "M" close to the base of the plant, sometimes also "*Monsp.*" Linné's statement is, "Professor Sauvages had received from Magnol (the great botanist) his entire herbarium, which Sauvages made me a present of."
- MARTIN, ANTON ROLANDSSON (1729-1786). Spitzbergen.
- MASSON, FRANCIS (1741-1805). A few plants from the Cape.
- MILLER, PHILIP (1691-1771). "Miller of Chelsea permitted me to collect many in the garden, and gave me several dried specimens, collected by Houston in South America."
- MINUART, JUAN (1673-1768). Spanish plants; he was a friend of Löfling.
- MITCHELL, JOHN (d. 1768), resident in Virginia from 1700 to 1748, when he returned to England.
- MONTI, GIUSEPPE (1682-1760), professor of botany at Bologna.
- MONTIN, LARS (1723-1785), pupil of Linné: travelled in 1749 in Lule Lappmark for plants; uncle of J. Dryander, Linné's pupil.
- MÜNCHHAUSEN, OTTO, *Freiherr* VON (1716-1774). North German plants.
- MURRAY, ADOLF (1751-1803), a favourite pupil of Linné, though amongst the younger students; sent plants from Padua to Linné.
- MUTIS, JOSÉ CELESTINO (1732-1808), resident in New Grenada (Colombia); his second collection arrived when Linné was too ill to examine them, so that the younger Linné described them in the 'Supplementum' and placed them in the herbarium with his written names. Escallon's plants were sent by Mutis. See Smith, *Corr. Linn.* ii. pp. 532, 537.
- MYGIND, FRANDS, afterwards FRANTZ VON (1710-1789). Many Austrian plants are marked as from him.
- NIETZEL, DIETERICH (1703-56). German gardener employed at Hartecamp, and from 1741 to his death, at Uppsala; cf. *Gard. Chron.* III. lvii. (1915) 353.
- NORDBERG, —. The name occurs in the 'Supplementum,' p. 265, as the sender of specimens of the nutmeg tree from Banda.

- OEDER, GEORG CHRISTIAN (1728-1791), the first editor of the 'Flora danica.'
- OLDENLAND, HENRIK BERNARD (d. 1761). Cape plants collected about 1760; given to Linné by J. Burman.
- ORTEGA, JOSÉ (d. 1761). Spanish plants; a friend of Löffling during his two years' stay in Spain.
- OSBECK, PEHR (1723-1805). Travelled to Canton as ship's chaplain; his plants are marked in the herbarium with O, or more frequently on the back with the name in full, as "Habitat in China. Osbeck"; about 600 plants from China.
- PALLAS, PETER SIMON (1741-1811). The distinguished traveller in Russia, who was born and died in Berlin.
- PONTIN, DAVID DAVIDSON (1733-1809). A cousin of Hasselquist; transmitted plants from Malabar.
- POTT, JOHANN FRIEDRICH (1738-1805), physician to the Duke of Brunswick; sent a few plants; see also under DU ROR.
- RATHGEB, JOSEPH VON (fl. 1744). Austrian Minister at Venice, who sent Italian plants to Linné.
- RICHARD, LOUIS CLAUDE MARIE (1754-1821). Mentioned in the 'Mantissa' as a contributor.
- ROLANDER, DANIEL (1725-1793). One of Linné's pupils, who went to Surinam, but on his return to Sweden gave all his plants to Count de Geer, to Linné's great disgust at the "ungrateful Rolander."
- ROSÉN (afterwards ROSENBLAD), EBERHARD (1714-1796); professor at Lund, and younger brother of Linné's colleague Nils Rosén (von Rosenstein). Plants from Skåne.
- RÖTTBÖLL, CHRISTEN FRIIS (1727-97), pupil of Linné, then professor of medicine and botany at Copenhagen; sent Cyperaceæ, etc. 1771-75; styled 'Friis' in his herbarium by Linné.
- ROYEN, ADRIAAN VAN (1705-1779). "On my assisting Van Royen to arrange the garden belonging to the University of Leyden, I obtained not only a large number of recent plants, but also many dried ones."
- ROYEN, DAVID VAN (d. 1799), professor in Leyden.
- SAHLBERG, JOHAN (1741-1810). A few Swedish plants.
- SAUVAGES, FRANÇOIS BOISSIER DE LA CROIX DE (1706-1767). Linné's most valued correspondent abroad; he contributed plants from the south of France, and also Magnol's herbarium; many specimens are labelled by him.
- SCHREBER, JOHANN CHRISTIAN DANIEL (1739-1810), an eminent pupil of Linné.
- SCHMIDEL, CASIMIR CHRISTOPH (1718-1792).
- SCOPOLI, JOHANN ANTON (1723-1788). Author of 'Flora Carniolica,' etc.; plants from south-eastern Europe.
- SEGUIER, JEAN FRANÇOIS (1703-1784). Chiefly alpine plants from Monte Baldo near Verona.
- SIBTHORP, HUMPHREY (1713?-1797), professor of botany at Oxford.

- SOLANDER, DANIEL (1733-1782). Next to Löfving, esteemed by Linné as his favourite pupil; plants from Pite Lappmark and England; wrote up Browne's Jamaica plants in the herbarium in 1759, and shortly afterwards left Sweden for London; never returned to his native land. See Biography in Banks's 'Journal,' edited by Sir Joseph Hooker, London, 1896, pp. xxxviii-xlii, with portrait by John Zoffany.
- SONNERAT, PIERRE (1749-1814), celebrated traveller in Tropical Asia.
- SPARRMAN, ANDERS (1748-1820). Another of Linné's noted pupils. He travelled to China (Canton), and published his travels, first as a thesis, and afterwards in a volume. Whilst staying at the Cape he was induced to join the Forsters in Cook's second voyage, on board the 'Resolution' in 1772, returning with them to the Cape in 1775 and coming home later. Numerous specimens in the herbarium, marked "Sp."
- STELLER, GEORG WILHELM (1709-1746). Assistant to Gmelin in the Siberian investigations; travelled to Kamtschatka, and crossed to North America; he died at Tiumen on his return homewards. His collections were bought by Demidoff and some were given to Linné; about thirty of his plants are in the herbarium.
- SWARTZ, OLOF (1760-1818). The specimens are chiefly lichens, ticketed with extreme care, and usually marked "Sz." or "O.S."; probably incorporated by the younger Linné.
- TERNSTRÖM, CHRISTOPHER (1703-1746). Travelled to India for natural history purposes, and died at Pulo-Condor.
- THOUIN, ANDRÉ (1717-1824), a munificent donor of dried specimens, chiefly to the younger Linné when in Paris.
- THUNBERG, CARL PETER (1743-1828). Traveller to the Cape, Ceylon and Japan; successor to the younger Linné in the Chair at Uppsala. His plants are marked "T" with a number referring to some MS. catalogue.
- TORÉN, OLOF (d. 1753). A ship's chaplain, and contemporary of Osbeck; visited Surat and Malabar; cf. Osbeck 'Dagbok' 316 (1757).
- TULBAGH, C. RIJK (d. 1771). Dutch Governor of the Cape, who made Linné "a present of above 200 of the rarest plants that grow there, all put up with great care, besides a number of roots and bulbs alive, for the purpose of being planted in the garden."
- TURRA, ANTONIO (1730-1796), professor at Vicenza. Sent Italian plants.
- TUVÉN, ERIK (fl. 1754). Sent *Orchis sambucina* to Linné from near Stockholm, the first record in Sweden.
- VANDELLI, DOMINGOS (fl. 1768-1789), professor in Lisbon. Sent Portuguese plants, and some from the Colonies.
- VELEZ, CRISTÓBAL (d. 1753), a friend of Löfving. Sent Spanish plants to Linné; his collection passed into the hands of Quer.
- WACHENDORF, EVERHARD JACOB VAN (1702-1758), of Utrecht, where he was Professor.

- WAGNER, JOHANNES GERHARD (1706–1759). His contributions are noted in the ‘Hortus Upsaliensis.’
- WÄNSTRÖM (or WENSTRÖM), S. M. Named in connection with two North African plants.
- WEIGEL, CHRISTIAN EHRENFRIED (1748–1831). Plants from Greifswald.
- WILCKE, SAMUEL GUSTAV [?] (fl. 1760–1765; d. 1791).
- WULFEN, FRANZ XAVER, *Freiherr* VON (1728–1805). Professor at Klagenfurt; sent Austrian plants.
- ZINN, JOHANN GOTTFRIED (1727–1759). Named as a contributor of plants, in the preface to the second edition of the ‘Species Plantarum.’
- ZOEGA, JOHAN (1742–1797). A Danish pupil highly esteemed by Linné: “If Fabricius brings me an insect, or Zoega a moss, I take off my hat and say, ‘Ye are my teachers,’” Fries, “Linné,” ii. Bil. xviii. 9.

The citations in the foregoing are mainly from Linné’s own autobiography in the ‘Egenhändig anteckningar,’ edited by Adam Afzelius in 1823; in the words of a translation from the manuscript printed in Maton’s edition of Pulteney’s ‘Linnæus’ in 1805, pp. 543–547, and condensed in Proc. Linn. Soc. 1887–88, pp. 20–22; see the Bibliography appended (p. 25).

LINNÉ AS A COLLECTOR.

Thus far we have considered the contribution to the herbarium; the next question is, how far did Linné himself collect specimens? His own statements are these:—“I have collected, from my infancy, all the plants of Sweden, together with those of the Swedish gardens” (Maton’s ed. of Pulteney’s ‘Linnæus,’ p. 574), but the following, copied from p. 515 of the same work, is somewhat discrepant; it describes him becoming acquainted with dried plants only, while living with Dr. K. Stobæus at Lund in 1727. “He was highly delighted with the mode of making a hortus siccus, and immediately began to collect all the plants that grew in the neighbourhood of Lund, and to glue them on paper.” After deserting Lund for Uppsala, in the spring of 1729, he told Prof. Olof Celsius that he “had above 600 indigenous plants preserved in his cabinet.” From hints in his works, and from indications in his herbarium, he seems to have collected at various times, such as his Lapland journey: when at Tuggenforsen in Lycksele Lappmark he gathered and named for the first time the *Linnea borealis*, on 29th May, 1732, though the genus is stated to be of Gronovius upon a scrap which he gave his friend in 1735. His three journeys to Öland and Gotland, West Gotland, and Skåne, produced additions; but many plants are those gathered in the Uppsala Garden, the produce of those innumerable packets of seeds, sent year after year to him, from a more genial climate, and now recognisable in the herbarium under the initials H. U., *i.e.* Hortus Upsaliensis.

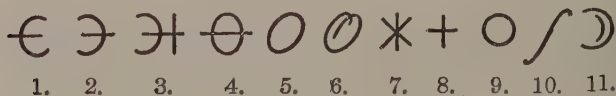
The younger Hartman mentions with evident surprise that so many Swedish plants should be absent from the collection, and in some cases the native plant is represented only by a specimen from a foreign country.

It can never be too emphatically stated, that it would be unjust to judge Linné's methods by modern ones, to condemn the pioneer because he could not foresee the latest developments, and to hold his collections cheap because the specimens are small and too often imperfect. The difficulties of travelling and sending specimens in those days quite sufficiently account for these imperfections.

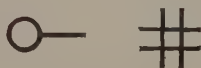
SIGNS EMPLOYED.

The herbarium itself has been so often described in the memoirs mentioned in the bibliography, that a detailed account is not wanted here. Besides the small size, both of paper and the actual specimens, a modern observer is struck with the want of information as to the collector, place, and time of receipt. Linné, it is certain, trusted to his memory, using abbreviations and arbitrary signs to remind him, should occasion require, of the circumstances under which he acquired the specimens. Some of these signs offer no difficulty, such as K for Kalm; others have been held as more doubtful, as Sp. for Sparrman, which is correct. The younger Hartman was puzzled by the use of the sign ∇ , the Greek capital delta reversed, but Linné was accustomed to use many of these, which were usual among medical men of his time. This particular sign means *aqua*, easily guessed from *Agrostis stolonifera* ∇ : *tica* (Hartman, p. 28) or *Veronica Anagall.* ∇ (Sp. Pl. ed. 1, p. 12), the latter when written out being *Veronica Anagallis-aquatica*, this pre-Linnean name appearing in the synonymy. *Scandix Pecten* ♀ (Sp. Pl. ed. 1, p. 256) is now invariably written in full as *Scandix Pecten-Veneris*, the ♀ being the astronomical sign used for the planet Venus, as well as by the mineralogist for copper. A long catalogue might be compiled of Linné's signs in his various works, though as he used the same sign at times with different meanings, it need not be pursued further.

But ever since the herbarium came into the possession of the Society, three signs stand out as especially enigmatic, they are numbers 1, 2 and 4 in the following:—



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11.



12.

13.

Hartman in his preface says:—"One of these signs very often occurs, either with a specific name or alone, what their meaning is, has not yet been made out; by comparison they seem neither to indicate localities, person's names, the duration of the plants, annual, biennial, perennial or the like," but he also points out that No. 2 above is confined to Siberian plants. My own first reference to the herbarium, in August 1874, made me ask Mr. Kippist, the then Librarian, what the sign (No. 4) meant, and he owned that he did not know, nor did anyone else.

The latest guess was that made a few years ago by Pastor Enander; his view is:—that they are certainly Russian letters, and thus may be regarded as pointing to J. P. Falck, born in Westgotland in the year 1732 or 1733, professor at the Medical College in St. Petersburg, with whom Linné stood in close relation (*Salices*, p. 11). Now although the sign No. 4 may be taken as the Greek Θ , it cannot stand for ϕ , and No. 1 resembles no current Russian letter whatever. This speculation therefore does not help us.

This tantalizing uncertainty therefore was a subsidiary point that I set myself on beginning my investigation of the herbarium to find out, where possible, what these puzzling memoranda meant. I therefore copied them each time they occurred, and at the end, I had lists of plants bearing the cryptic signs. By comparison of the whole material thus obtained, I was able to set out the meaning of most of the signs occurring, thus:—

- No. 1. Collected by Gerber, principally in the district of the river Don or Astrachan.
- No. 2. From Siberia, communicated by Gmelin.
- No. 3. From Kamtschatka, collected by Steller.
- No. 4. Hasselquist's plants, as also No. 6.
- No. 5. Almost certainly Osbeck; see No. 9.
- No. 6. Hasselquist, the sign appears to be derived from "Habitat in Oriente." I have tried to discover if there was any reason why two signs for one collector were employed, but so far fruitlessly.
- No. 7. Unknown; applied to *Bellis annua*, a *Sisymbrium*, a *Trigonella*, and an unnamed specimen of *Conferva*.
- No. 8 is used as meaning "aristate," and
- No. 9 for "muticous," but the terms seem sometimes loosely applied, and in one case misapplied; the latter sign is also confused with Osbeck, and with $\odot$ for annual.
- No. 10. May be a long S, and stand for "suecia"; a cross-stroke is sometimes present; Linné often used a small initial, as "stockholm."
- No. 11. Occurs in relation to *Anthericum calyculatum*, *Ornithogalum minimum*, *Salix rosmarinifolia*, and *Sisymbrium altissimum*. With regard to the third, Enander prints the sign as $\mathfrak{D}$, which means silver to the mineralogist, and may refer to a silvery appearance of the specimen.

No. 12. P. J. Bladh's plants.

No. 13. Cristate, e. g. *Erica cordifolia*; cf. Nos. 8 & 9.

NUMBERS EMPLOYED.

The system of numbering adopted by Linné must be mentioned. The numbers found in the herbarium, either alone, or in association with a specific name, refer to the numbers given in the original edition of the 'Species Plantarum' in 1753; additional species were lettered in capitals and intercalated in their appropriate place: thus *Hedysarum* in the 10th edition of the 'Systema' has no fewer than twelve, A to L inclusive. In the second edition of the 'Species' 1762-3, an entirely new numbering was carried through, and in the 12th edition of the 'Systema' 1767, additions were numbered in sequence with the 'Species' numbers, but put into their affinity, regardless of numerical order; this emended set was not applied to the herbarium. After this date, such numbers were abandoned. Numbers are also found referring to lists sent with plants, the 'Flora lapponica,' etc.

DAMAGE TO HERBARIUM BEFORE 1783.

The herbarium suffered risks and actual damage before it came into the hands of Smith in 1784. We have an account by Beckmann, the author of the 'Century of Inventions,' that on 30th April, 1766, a fire broke out in Uppsala during a fierce gale and destroyed a large part of the town. Linné had his herbarium and library removed to a barn outside the town, but the risk to which it was exposed led him to build his little museum at Hammarby, some distance from the house, and without a fireplace. This in its turn produced the opposite evils of damp and mould; the younger Linné complained of the terrible damage done by mice, mould and insects, and at the first opportunity, he removed the collections once more into the town. Linné left a memoranda begging that the herbarium should be kept from harm by mice or moths, that no naturalists should have a single specimen—valuable by itself, it would acquire added value by age, and he then gave the probable value of the various parts of his collections. But a loss had already taken place before the death of its possessor; the son in a letter of 1779 to Archiater Bäck, says:—"My late father weeded out his herbarium, while he was able to work, and seems to have burned all the duplicates, why, no one knows" (Fries, Linné, ii. p. 416, note). The terrible damage by mice is not now perceptible, for I only noticed two sheets which had been gnawed besides three of the undetermined; the son must have withdrawn the damaged sheets, and amongst these may have been those I have had to note as missing, such as *Cupania* and *Sarracenia*.

COLLATERAL TYPE-COLLECTIONS.

There are other collections which may be looked upon as containing types of Linné's species, especially when his own herbarium is wanting in them, or they were acquired after the descriptions were published. The Martin-Burser herbarium at Uppsala is a case in point; in the *Am. Acad. i.* pp. 141-171 will be found descriptions of 250 plants, with Linnean names to fit those according to Caspar Bauhin's '*Pinax*,' and several of them seem never to have been represented in Linné's herbarium at any time, such as *Poa Eragrostis*, *Anthoxanthum paniculatum*, *Allium sphærocephalum*, *Senecio incanus* and *Oenante crocata*. Clifford's herbarium is now at the British Museum, having been bought by Banks, and is valued, as showing the originals of Linné's descriptions in his '*Hortus Cliffortianus*.' Then, too, it is certain that he described many species of *Lichen* in the broad sense, from the Dillenian herbarium at Oxford. In the preface to the '*Species Plantarum*,' ed. 2, we find him specifying the gardens which he has gone through: Paris, Oxford, Chelsea, Hartecamp, Leyden, Utrecht, Amsterdam, Uppsala and others. From these he may have had a good supply of specimens, but very few of the list of herbaria following could have afforded so liberal a supply; Burser, Herman, Clifford, Burman, Oldenland (in Burman's possession), Gronovius, Roijen, Sloane, Sherard, Bobart, Miller, Tournefort, Vaillant, Jussieu, Surian (St. Domingo plants in Jussieu's herbarium), Bäck, and Browne. Anything in these of special note must almost certainly have been described from those specimens.

In the year 1760 the younger Burman visited Linné at Uppsala, bringing with him his father's large collection of Cape plants, in which department the Dutch were supreme; many amongst these were new to science, and formed the types of such as were described by Linné on this occasion.

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In the following bibliography I have given my authorities for the statements made above with regard to the Linnean herbarium; its growth, and subsequent history. Although I have arranged the titles of the various theses according to the dates when they were sustained, yet for the sake of convenience in citation I have confined my references to Schreber's edition of the '*Amœnitates Academicæ*,' Erlangæ, 1787-90, 10 vols. 8vo. I have not cited the '*Flora Suecica*,' ed. 2, Stockholm 1755, throughout, for although I extracted nearly 30 additional names, I cannot assert that plants were sent to Linné as vouchers, or to add to his collection.

1745. *Plantæ Martino-Burserianæ; resp. R. Martin.* (*Am. Acad. i.* 141-171.)

—— *Hortus Upsaliensis, resp. S. Naucler.* (*Am. Acad. i.* 197, 198.)

1748. Hortus Upsaliensis, tom. i. (et unic.) præf. p. [2].
1750. Plantæ Camtschatcenses rariores, *resp.* J. P. Halenius. (Am. Acad. ii. 336-363.)
1751. Nova Plantarum genera, *resp.* L. J. Chenon. (Am. Acad. iii. 8-25.)
1753. Species Plantarum, præf. p. 4 [-5].
1755. Centuria prima plantarum, *resp.* A. J. Juslenius. (Am. Acad. iv. 261-296.)
1756. Centuria secunda plantarum, *resp.* E. Torner. (Am. Acad. iv. 297-332.)
- Flora palaestina, *resp.* B. J. Strand. (Am. Acad. iv. 441-467.)
1757. Buxbaumia. *Resp.* A. R. Martin. (Am. Acad. v. 78-91.)
1758. Systema Naturæ. Ed. X. Vol. i. præf. p. [2].
1759. Flora capensis. *Resp.* C. H. Wännman. (Am. Acad. v. 356, 358.)
- Flora jamaicensis. *Resp.* C. G. Sandmark. (Am. Acad. v. 371-388.)
- Pugillus jamaicensium plantarum. *Resp.* G. Ehngren. (Am. Acad. v. 389-413.)
1762. Species Plantarum. Ed. 2, præf. f. 4 verso, 5.
1766. Necessitas historiae naturalis Rossiae. *Resp.* A. de Karamyschew. (Am. Acad. vii. 438-460; Fl. sibirica, *ib.* 460-465.)
1767. Systema Naturæ. Ed. XII. Vol. i. præf. p. [2].
- Mantissa plantarum 1-142 (2).
1768. Iter in Chinam. *Resp.* A. Sparrman. (Am. Acad. vii. 497-506.)
1771. Mantissa plantarum altera (4) 143-588.
1774. Planta Cimicifuga. *Resp.* J. Hornborg. (Am. Acad. viii. 193-204.)
1775. Plantae surinamenses. *Resp.* J. Alm. (Am. Acad. viii. 249-267.)
1781. Supplementum plantarum editum a C. a Linné. Brunsvigæ. [The species of the elder Linné are now ascertainable, being marked in the 'Index.']
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- [The Swedish original was printed in 'Egenhändiga afteckningar af Carl Linnæus om sig sjelf,' printed by A. Afzelius at Stockholm, 1823. 4to.]

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[The special portion referring to the Collections and their disposal will be found in Vol. ii. pp. 413-429.]
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EXPLANATION OF THE ABBREVIATIONS AND SIGNS
 USED IN THE PAGES OF THE (1912) 'INDEX.'

Specific names printed in Roman type, as "*fastuosa*," show that a plant is so termed in the herbarium by Linné himself; if by an amanuensis and clearly under Linné's direction, that is indicated by the addition in parentheses of the name of the amanuensis, as, for instance, under *ACALYPHA virgata* (m. Sol.)=manu Solandri, or the name on the sheet being in the handwriting of D. Solander, or (m. L. f.) where the handwriting is that of the younger Linné.

Specific names in *italic* type show that there is no specimen so named by Linné, but in cases where there can be no doubt as to the actual plant, I have added (pl.). Thus *ABRUS precatorius* is the only species, and is represented by a specimen, but does not show the name as written by Linné; sometimes the number from the 'Species Plantarum,' ed. I. is put, but although there can be, in monotypic genera especially, no doubt as to the authenticity of such specimen, I have kept to my rule of not printing in Roman type, unless the name is written in full by Linné.

The numbers following the genera refer to the running numbers of the Catalogue of the Herbarium, as printed in Proc. Linn. Soc. 1906-7, pp. 96-112.

The numbers (1, 2, or 3) following the species refer to the enumeration in which they first occur, thus:—

In 1753 by the figure 1.

„ 1755 „ „ 2.

„ 1767 „ „ 3.

These lists are fully explained on p. 10. Where no figure follows, the specimen was obtained after 1767, or was by some accident not recorded by Linné.

The same specimen was frequently shifted by Linné, as his views of affinity changed. I have tried to point out where a specimen may be found, by adding the later name, as under *ACHYRANTHES repens* = *Illecebrum Achyrantha*, which means that the specimen is now in *ILLECEBRUM*. MS. names are shown by that abbreviation; when they were published in the 'Supplementum' which bears the name of the younger Linné as author, the abbreviation of "Suppl." has been affixed; this has the further interest of pointing out which species in that work are really due to the father and not to the son.

The types of the younger Linné in the herbarium are not as a rule indicated; they have been left for another opportunity. The zoological lists which were brought to light during the preparation of this Index have been printed in 1913.

The numbers following the generic name in Clarendon type, refer to the Catalogue drawn up by David Don and Richard Kippist, when the Linnean Collections were acquired in 1830, after the death of Sir James Edward Smith; they are still used when consulting the Herbarium.

(Some modifications have been made in the MS. Catalogue, which are explained in the Foreword.)

HISTORY OF THE NAME *LINNÆA*.

Examples of the use of the generic name *Linnæa* by Linnæus himself several years before it was published in his 'Genera.'

- I. 'Spolia botanica,' a MS. written in 1729; on the first page "*Linnæa*" has been written, but partially erased, and his patron's name, "*Rudbeckia*," substituted.

Originally published by Dr. E. Ährling, but independently discovered again some years afterwards.

- II. MS. 'Iter lapponicum'; record of 29th May, 1732, o. s. [=9th June, n. s., when specimens were gathered at Tugganforsen]. Published by Sir J. E. Smith (1811), Dr. Ährling (1889), and Prof. T. M. Fries (1913).

- III. 'Genera plantarum'; p. 188 (1737) nominally by J. F. Gronovius, but drawn up in Linnæus's style, and not that of Gronovius.

- IV. Block from a photograph of the actual specimen given by Linnæus to Gronovius, to justify the publication; from Prof. T. M. Fries; the original specimen is in the Botanical Department of the British Museum (Natural History).
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ADDITIONS AND CORRECTIONS
 TO THE
 “INDEX”
 ISSUED AS A SUPPLEMENT
 in 1912
 TO THE ‘PROCEEDINGS’ OF THAT DATE.

Page 8, line 4 from bottom, the last word should read actual.

11, after line 33, insert COMMERSON, PHILIBERT (1722-1773),
dried plants received in 1754.

14, line 40, read GERHARD.

15, „ 13, for p. 17 read p. 18.

18, after line 6, insert WEIGEL, CHRISTIAN EHRENFRIED (1748-
1831), plants from Griefswald.

18, line 33, for autumn read spring.

23, „ 5 from bottom, for On read Om.

26, line 3, read D. Solander.

27, col. 1. ACER orientale = creticum.

2. ACHILLEA inodora = Athanasia annua.

28 2. ACROSTICHUM ferrugineum = ferruginosum.
nodosum cf. Asplenium nodosum.

29 1. ADIANTUM pygmaeum, lapsu, vide Asplenium pygmaeum.

30 2. AIZOON lanceolatum cf. paniculatum.

32 1. ALOPECURUS grossarius cf. Panicum grossarium.
ALYSSUM Alyssoides = calycinum.

34 1. ANDROPOGON quadrivalve = nutans (err. typ.).
ANEMONE canadensis cf. pennsylvanica.

- Page 34, col. 2. *philadelphia MS. lapsu=pennsylvanica.*
ANONA discreta=*Unona discreta.*
- 35 1. *ANTHEMIS cretica*=*montana.*
 fruticosa=*Osmites Bellidiastrum.*
 ANTHERICUM hispidum cf. *Asphodelus capensis.*
- 36 1. *ANTIRRHINUM hastatum*, MS.=*cirrhosum.*
- 37 2. *ARENARIA mucronata*=*Alsine mucronata.*
- 38 1. *ARETIA Vitaliana*=*Primula Vitaliana.*
 2. *ARTEMISIA ambigua* cf. *Seriphium ambiguum.*
- 40 1. *ASPARAGUS terminalis*=*Dracaena terminalis.*
 2. *ASPHODELUS capensis*=*Anthericum hispidum.*
 ASPLENIUM radicans=*rhizophorum.*
 rhizophyllum. 2. =*rhizophorum.*
- 41 1. *ASTER oppositifolius*=*Cineraria Amelloides.*
 polifolius. 3. =*Inula caerulea.*
 2. *ASTRAGALUS tenuifolius.* 3. =*A. Onobrychis.*
 tragoides=*tragacanthoides.*
- 42 1. *ATRACTYLIS fruticosa*=*Gorteria fruticosa.*
- 43 1. *AZALEA pontica*=*Rhododendron* [flavum, G. Don, *non*
 ponticum, L.].
- 44 2. *BETONICA hirta*=*Stachys recta.*
 BIDENS fruticosa=*Verbesina fruticosa.*
- 45 2. *BORASSUS flabelliformis* MS.=*flabellifer.*
- 47 1. *BRYUM capillare*=*Mnium capillare.*
 2. *rubrum*=*simplex.*
 BULBOCODIUM serotinum=*Anthericum serotinum.*
- 48 1. *BUPLEURUM villosum*=*Hernas depauperata.*
- 51 1. *CAPRARIA gratioides*=*Lindernia Pyxidaria.*
 CARDAMINE Lunaria=*Ricotia aegyptiaca.*
- 52 2. *CARTHAMUS corymbosus*=*Echinops corymbosus.*
 CASSIA galegifolia=*biflora.*
- 54 1. *CENTAUREA fruticosa*=*Stachelina fruticosa.*
 2. *sessiliflora*=*nigra.*
- 55 2. *CHENOPODIUM altissimum*=*Salsola altissima.*
- 56 1. *fruticosum*=*Salsola fruticosa.*
 hirsutum=*Salsola hirsuta.*
 salsum=*Salsola salsa.*
 virginicum. 1. =*aristatum.*
 CHIRONIA dodecandria=*Chlora dodecandra.*
 CHLORA dodecandra ut suprâ.
 perfoliata. 3. cf. *Gentiana perfoliata.*
- 57 2. *CINERARIA sonchifolia* cf. *Othonna sonchifolia.*
- 59 1. *CLERODENDRUM scandens* MS. cf. *Knoxia scandens.*
 CLITORIA brasiliiana=*Glycine Galactia.*
 Galactia=*Glycine Galactia.*

Page 59, col. 2. CLUTIA [postea CLUTIA].

CLYPEOLA *Alyssoides*=Alyssum calycinum.

line 6, read Alaternoides.

„ 18, read calycinum.

- 60 1. COMETES *surattensis*=alterniflora.
2. COMMELINA *axillaris*=Tradescantia axillaris.
cristata=Tradescantia cristata.
- 61 1. CONVULVULUS *aculeatus*=Ipomoea Bona-nox.
aegyptius=pentaphyllus.
alsinoides=Evolvulus alsinoides.
gangeticus cf. Evolvulus gangeticus.
linifolius=Evolvulus linifolius.
2. *nummularius*=Evolvulus nummularius.
tridentatus=Evolvulus tridentatus.
- 62 1. CORDIA *Bourreria*=Ehretia Bourreria.
glabra. 1. cf. C. Callococca.
- 63 2. COREOPSIS *angustifolia*=Rudbeckia angustifolia.
- 63 1. COTULA *capensis* cf. Matricaria capensis.
- 64 1. CRASSULA *ramosa* MS. [post '*punctata*' ponendum].
2. line 12, read Rhagadioloides.
CROTALARIA *alba*=Sophora alba.
- 65 1. *villosa*=Sophora biflora.
CROTON *ricinocarpus* cf. Mercurialis *procumbens*.
- 66 1. CYNANCHUM *aphyllum* cf. Euphorbia *viminalis*.
- 67 1. CYTISUS *aethiopicus*=Ononis *cernua* [β].
2. *monspessulanus*=Genista *candicans*.
- 68 2. DIANTHUS *saxifragus*=Gypsophila *saxifraga*.
DIAPENSIA *helvetica*=Aretia *helvetica*.
- 69 2. DOLICHOS *pubescens*. 3. cf. Glycine *tomentosa*.
- 70 1. DRACOCEPHALUM *sibiricum*. 3. cf. Nepeta *sibirica*.
2. DRUPINA *cristata* [=Besleria *bivalvis*, Linn. f.].
ECHINOPS *corymbosus* cf. Carthamus *corymbosus*.
- 71 1. ELLISIA *acuta*=Duranta *Ellisia*.
- 72 2. ERICA *pallide-purpurea*=*purpurascens*.
- 73 2. ERYTHRINA *Piscipula* cf. Piscidia *Erythrina*.
- 74 1. line 19, read Colpoon=Cassine *capensis*?
- 75 1. EUPHORBIA *viminalis* cf. Cynanchum *aphyllum*.
Evolvulus *gangeticus* cf. Convolvulus *gangeticus*.
- 76 1. FEVILLEA *trilobata* . . . 1179] cf. Trichosanthes *punctata* (pl.).
- 77 1. FUCUS *excisus*=canaliculatus.
muscoides=aculeatus.
2. FUMARIA *cucullata* [ante "Cucullariam" ponenda].
- 79 1. GENTIANA *perfoliata*. 1. cf. Chlora *perfoliata*.
quadrifolia=Chlora *quadrifolia*.

- Page 79, col. 2. GERANIUM rapaceum cf. prolificum.
- 80 1. GERARDIA nigrina [transponenda ab Gesneria].
GESNERIA [nigrina, lapsu, vide suprâ].
GINKGO [sphalm. GINGKO].
- 81 1. GLYCINE tomentosa. 1. cf. Dolichos pubescens.
GNAPHALIUM decurreps = Conyza decurrens.
2. niveum = Stoebe gnaphaloides.
- 82 1. virgatum = Conyza virgata.
- 84 1. HEDYSARUM Ecastophyllum. 3. cf. Pterocarpus Ecasto-
phyllum.
prostratum = Indigofera enneaphylla.
85. 2. HESPERIS provincialis = Cherianthus tristis.
HIBISCUS cancellatus Suppl. (" Cf. " deletur).
- 86 2. HIPPOMANE glandulosa = biglandulosa.
- 87 2. HYDRASTIS canadensis. 3. cf. Hydrophyllum canadense.
HYDROPHYLLUM canadense. 3. cf. Hydrastis (ut praec.).
- 88 1. HYOSCYAMUS atropoides = H. Belladonna (ponitur post
" album ") (non Belladonnae).
HYPERICUM chinense = monogynum.
- 89 1. HYPOCHAERIS urens cf. Seriola urens.
HYPOXIS ovata Linn. f. [post " minuta " ponenda].
- 90 2. INULA Trivis = Perdicium radiata.
IPOMOEA alba = I. Bona-nox.
rubra cf. Polemonium rubrum.
verticillata = Convolvulus verticillatus.
- 93 1. KNOXIA scandens = Clerodendrum scandens MS.
2. LAETIA americana = apetala.
Thamnia = apetala.
- 94 1. LAPSANA capillaris = Crepis virens.
chondrilloides = Crepis pulchra.
- 95 1. LEONTODON Dandelion = Tragopogon Dandelion.
lanatum = Tragopogon lanatum.
LEONURUS indicus cf. Phlomis zeylanica.
2. LEUCADENDRON acaulon [= Protea acaule, Thunb.].
cancellatum = Protea pinifolia ♀.
Conocarpodendron [= Leucospermum conocarpum,
R. Br.].
Scolymocephalum [= Protea Scolymus, Thunb.].
- 98 2. LOBELIA hirta = zeylanica.
prona MS. [pone post " Plumieri "].
volubilis [Burm. f.] [post " urens " ponenda].
- 99 1. LONICERA parasitica cf. Loranthus lonicerioides.
LORANTHUS lonicerioides [ut praec.].
LOTUS mauritanicus. 3. cf. Ononis mauritanicus.
prostratus. 3. cf. Ononis prostrata.

Page 102, col. 1. MATRICARIA capensis. 3. cf. Cotula capensis.
inodora = Chrysanthemum inodorum.
recutita = suaveolens.

2. MELALEUCA *Leucadendron* (pl.) cf. Myrtus *Leucadendron*.
 MELAMPODIUM australe (m. L. f.) cf. Unxia camphorata.
- 103 2. MERCURIALIS *procumbens* cf. Croton *ricinocarpus*.
- 105 1. MIMOSA *cinerea* cf. M. *Cineraria*.
- 106 2. MUCOR *unctuosus* = *septicus*.
- 107 2. MYRTUS *Leucadendron* = Melaleuca *Leucadendron*.
 NAPAEA laevis = hermaphrodita.
 scabra = dioica.
 NARDUS articulata = Aegilops incurvata.
- 108 1. NEPETA *latifolia* MS. [pone post '*italicam*'].
 sibirica. 1. cf. Dracocephalum *sibiricum*.
2. OCHNA *Jabotapita* = *squarrosa*.
- 109 1. OENOTHERA *parennis* = *pumila*.
 OLDENLANDIA capensis (non capense).
2. ONONIS *cernua* cf. Cytisus *aethiopicus*.
- 110 1. OPHRYS *latifolia* = *lilifolia*.
 2. ORCHIS *satyroides* cf. *biflora*.
- 111 1. *line* 34, read *Scorpioides*.
- 112 1. OTHONNA *geifolia* = *Cineraria geifolia*.
 parvifolia cf. Senecio *rigens*.
 sonchifolia cf. *Cineraria sonchifolia*.
- 113 1. PANICUM *repens* [non '*repens*'].
 2. PARIETARIA *zeylanica* = *Urtica alienata*.
 PASSERINA *dodecandra* = *Struthiola erecta*.
- 115 2. PHACA *sulcata* = *Astragalus sulcatus*.
- 116 2. PHLOMIS *zeylanica* cf. Leonurus *indicus*.
- 117 2. PISCIDIA *Erythrina* cf. *Erythrina Piscipula*.
- 118 2. PLINIA *pinnata* = *crocea*.
- 119 1. POLEMONIUM *rubrum* cf. *Ipomoea rubra*.
- 121 2. PORTULACA *Portulacastrum* = *Sesuvium Portulacastrum*.
 triangularis cf. *racemosa*.
- 122 1. PROTEA *fusca* = P. *Levisanus*.
- 123 1. PSORALEA *pinnata*. 1. cf. *Indigofera enneaphylla*.
 2. PTERIS *dichotoma* = *Acrostichum furcatum*.
 rufa = *Acrostichum rufum* [Am. Acad. ed. Schreb
 i. 276].
 PTEROCARPUS *Ecastaphyllum* cf. *Hedysarum castaphyllum*.
- 124 1. QUERIA *canadensis* ["*canadensi*" err. typ.].
 2. RANUNCULUS [*flagelliformis*, Sm.] "*Mutis*" m. Linn
 apud herb. Sm.

- Page 125, col. 1. *RAUVOLFIA tetraphylla* = nitida + caulescens.
RESEDA suffruticulosa = fruticulosa.
2. *RHAMNUS siculus* = pentaphyllus.
- 126 2. *ROBINIA Acacia* = R. Pseud-acacia.
- 129 1. *SALIX depressa* = lanata.
- 131 1. *SATUREJA virginiana* = Thymus virginicus.
- 132 1. *SCHOENUS deustus* MS. [cf. seq.].
ustulatus = deustus.
- 135 2. *SERIOLA urens* cf. Hypochaeris urens.
SERIPHIMUM ambiguum cf. Artemisia ambigua.
SERRATULA Chamaepeuce cf. Staehelina Chamaepeuce.
- 136 1. *SESILI Carvifolia* = Selinum Carvifolia.
SIBTHORPIA africana = peregrina q. v.
peregrina = Disandra prostrata.
SICYOS trifoliata = Cissus acida.
- 137 1. *SILPHIUM helianthoides* = solidaginoides.
- 138 1. line 12, for "*groecum*" read "*graccum*."
- 139 1. *SOLIDAGO Doronicum* = Senecio Doronicum.
- 140 2. *SPINIFEX squarrosus* [non '*squarrosus*'].
SPONDIAS lutea [non '*lutea*'].
- 141 1. *STACHYS recta*. 3. cf. *Betonica hirta*.
STAEHELINA Chamaepeuce cf. *Serratula Chamaepeuce*.
- 143 2. *THESIUM Frisea* [non '*Frisia*'].
- 144 1. *THYMUS virginicus* cf. *Satureja virginiana*.
2. *TOURNEFORTIA cymosa*. 3. cf. *glabra*.
- 145 2. *TRICHOSANTHES punctata* (pl.) cf. *Fevillea trilobata*.
- 146 1. *TRIFOLIUM fruticans* = *Psoralea bracteata*.
Melilotus var. *corniculata* = *Trigonella corniculata*.
2. *TRIGONELLA corniculata* [cf. praec. 1].
- 147 1. *TRITICUM hybernum* [non '*hybernum*'].
- 148 1. *UNONA discreta* (pl.) cf. *Annona discreta*.
UNXIA camphorata. Suppl., cf. *Melampodium australe*.
URTICA africana MS. = *capensis*, *Linn. f.*
- 149 2. *VERBESINA fruticosa* (m. L. f.) cf. *Bidens fruticosa*.
- 150 2. *VIOLA arborea* cf. *V. Hybanthus*.
- 151 2. *XERANTHEMUM ciliatum* = *Gorteria squarrosa*.
erucifolium = *Centaurea radiata*.
- 152 2. *ZINNIA peruviana* = pauciflora.

